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Connecticut Agricultural Experiment Station
New Haven, Connecticut

TWENTY-EIGHTH REPORT

OF THE

STATE ENTOMOLOGIST

OF

CONNECTICUT

1928

W. E. BRITTON, Ph.D.
State Entomologist

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The Bulletins of this Station are mailed free to citizens of Connecticut who apply for them, and to other applicants as far as the editions permit.

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AUTHORSHIP

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ILLUSTRATIONS

The illustrations in this Report (Bulletin 305) are from the following sources: Figs. 57 and 62, prepared from base maps by B. H. Walden; Fig. 63, from Report for 1911, by A. B. Champlain; all other figures by Philip Garman. The Plates are all from photographs. Plate XXII by W. E. Britton; Plate XXIII, a., by J. Kimport; Plate XXIV, b, and c, from Japanese Beetle Laboratory, U. S. Dept. of Agriculture; Plates XXXII–XXXV by R. C. Botsford; Plate XXXVI, a, by Philip Garman; all others by B. H. Walden.

BULLETIN 305

TWENTY-EIGHTH REPORT

OF THE

State Entomologist of Connecticut

To the Director and Board of Control of the Connecticut Agricultural Experiment Station:

I have the honor to transmit herewith my twenty-eighth report as State Entomologist of Connecticut. Two important projects just completed are not included because the results of each investigation will be published as a separate bulletin. The official inspection and control operations prescribed by statute are given in some detail, and other research work conducted by members of the Department staff is included in this report.

Respectfully submitted,

W. E. Britton,
State and Station Entomologist.

SUMMARY OF OFFICE AND INSPECTION WORK

308 samples of insects received for identification.
245 nurseries inspected.
243 regular certificates granted.
141 duplicate certificates to be filed in other states.
2 special raspberry certificates granted.
104 nursery dealer's permits issued.
261 shipper's permits issued to nurserymen in other states.
237 parcels of nursery stock inspected and certified.
151 bales of mountain laurel and other decorative material inspected and certified for shipment.
45,500 narcissus bulbs inspected and certified.
475 shipments of seed corn inspected and certified.
14,287 certificates on nursery and floral stock and 5,204 certificates on farm products issued for shipments from the Japanese beetle quarantined area.
4,863 certificates issued covering soil and plants from the Asiatic beetle quarantined area.
43 orchards and gardens examined.
26 shipments, containing 277 cases, 2,680,700 plants imported nursery stock inspected.
15 shipments, or 58 per cent found infested with insects.
852 apiaries, containing 8,023 colonies inspected.
9 apiaries and 26 colonies found infested with European foul brood.
36 apiaries and 79 colonies found infested with American foul brood.
3,395 letters* written on official work.

* Including 600 written at the Japanese beetle Quarantine station.

717 circular letters sent out.
244 post cards sent out.
26 reports to Federal Horticultural Board.
1,710 bulletins, etc., mailed on request or to answer inquiries.
201 packages sent by mail or express.
54 lectures and addresses at meetings.

PUBLICATIONS OF THE ENTOMOLOGICAL DEPARTMENT, 1928

By W. E. Britton:

Twenty-seventh Report of the State Entomologist of Connecticut (Bulletin 294), 116 pages, 11 figures, 36 plates, May 1928.

Regulations Concerning the Transportation of Nursery Stock in the United States and Canada. Bulletin of Immediate Information No. 61, 24 pages; 1300 copies, September 1928.

Report of Committee on Injurious Insects, Proceedings Connecticut Pomological Society, 37th Annual Meeting, page 16, July 1928.

Insects Attacking Vegetable Crops in 1927. Report of Committee on Insects, Connecticut Vegetable Growers Association, page 66, June 1928.

The Elm Leaf Beetle, *Tree Talk*, Vol. 8, No. 4, page 32. March 1928.

Some Insect Pests of Cultivated Plants, in *Garden Guide*, 5th Edition, page 293, July 1928.

Oil Sprays and Oil Injury, *Journal of Economic Entomology*, Vol. 21, page 418, April 1928. (Also 300 reprints with Middleton's paper.)

The Fourth International Congress of Entomology, *Journal of Economic Entomology*, Vol. 21, page 651, October 1928.

Book Review: Some Garden Pests, What they are and How to Control Them, by C. T. Gregory and J. J. Davis, *Journal of Economic Entomology*, Vol. 21, page 793, October 1928.

By W. E. Britton and R. C. Botsford:

Anti-Mosquito Activities in Connecticut in 1927, Proceedings Fifteenth Annual Meeting, New Jersey Mosquito Extermination Association, page 146, 1928.

By W. E. Britton and M. P. Zappe:

Some Insect Pests of Nursery Stock in Connecticut, Bulletin 292, 61 pages, 27 figures, 20 plates; 4000 copies, March 1928.

Inspection of Nurseries in 1927, Reprinted from the Report (Bulletin 294) page 210, May 1928.

By M. P. Zappe:

Fighting the Apple Maggot and the Control of Aphis, Proceedings Connecticut Pomological Society, 37th Annual Meeting, page 24, July 1928.

By Philip Garman:

Dusting Menaces Fruit Growers; *Gleanings in Bee Culture*, Vol. LVI, page 293, May 1928.

The European Red Mite, Peach Moth, and Plum Curculio, Proceedings Connecticut Pomological Society, 37th Annual Meeting, page 28, July 1928.

By R. B. Friend:

Book Review: "Shädlings bekämpfung" by Dr. Walter Trapman, *Journal of Economic Entomology*, Vol. 21, page 794, October 1928.

INSECT PEST ACCOUNT

Report of Receipts and Expenditures of the State Entomologist

From July 1, 1927 to June 30, 1928

Receipts

Insect Pest Appropriation, biennial period ending June 30, 1929	$60,000.00
Additions, miscellaneous receipts	27.36
	$60,027.36

Disbursements

Salaries	$15,450.00	
Labor	16,709.25	
Stationery and office supplies	125.35	
Scientific supplies (Chemicals)	42.93	
" " (Other laboratory supplies)	25.61	
" " (Photographic ")	57.38	
Insecticides, etc.	130.67	
Lumber and small hardware	.73	
Miscellaneous supplies	841.64	
Automobile oil	62.31	
Telegraph and telephone	167.74	
Postage	91.22	
Travel expense (Outlying investigations)	2,219.31	
" " (Meetings, Conferences, etc.)	259.53	
" " (Gasoline for automobiles)	507.06	
Freight, express and parcel post	15.33	
Electricity	45.30	
Furniture and Fixtures (New)	180.65	
" " " (Repairs)	19.15	
Library (Books and Periodicals)	201.05	
" (Binding)	82.35	
Scientific equipment (New)	21.48	
Livestock	1.35	
Automobiles (New)	544.00	
" (Repairs)	256.90	
Tools, Machinery and Appliances (New)	48.63	
" " " " (Repairs)	7.10	
New Buildings and Structures	234.24	
Buildings (Repairs and Alterations)	10.58	
Rent of Land and Buildings	314.66	
Insurance (Automobile)	169.47	
Miscellaneous Contingent Expenses	72.44	
Total Disbursements		38,915.41
Balance		21,111.95

DEPARTMENT STAFF AND WORK

W. E. Britton, Ph. D., *State and Station Entomologist.*
B. H. Walden, B.Agr., *Photographic and General Work.* } *Assistant*
M. P. Zappe, B. S., *Inspection and General Work.* } *Entomologists.*
Philip Garman, Ph.D., *Research Work.* }
Roger B. Friend, Ph.D., *Research Work.* }
J. F. Townsend } *Field Technicians.*
B. W. McFarland }
J. Peter Johnson, B.S., *Deputy in Charge of Asiatic and Japanese Beetle Quarantines.*
John T. Ashworth, *Deputy in Charge of Gipsy Moth Work.*
James A. McEvoy, *Assistant in Gipsy Moth Work.*
Robert C. Botsford, *Deputy in Charge of Mosquito Work.*
Miss Grace A. Foote, B.A., *Secretary.**
Mrs. Gladys Brooke, B.A., *Secretary.*†
H. W. Coley, Westport } *Apiary Inspectors.*
A. W. Yates, Hartford }

Mr Walden has been in charge of the office during the absence of the Entomologist, and has continued to serve as chief photographer of the department. He has also had charge of certain exhibits for the department and has assisted in the inspection, fruit scoring and in the general work of the department. He has also continued his researches on the imported currant worm, *Pteronidea ribesi* Scop.

Mr. Zappe has continued in charge of the inspection of nurseries and of imported nursery stock. He has also been placed in charge of clean-up work around infestations of European corn borer, in cooperation with the Federal Bureau of Entomology. He has worked with Dr. Garman in the study of the plum curculio in apple orchards during the five-year period 1924-1928 and the results are now ready for publication. With Mr. E. M. Stoddard of the Botany Department, he has visited many orchards to observe pest development and to recommend the time and materials for pest control.

Dr. Garman has continued his investigations on the life history and control of the Oriental peach moth, *Laspeyresia molesta* Busck. He and Mr. Zappe have studied the methods of control for the plum curculio, *Conotrachelus nenuphar* Hbst., in apple orchards and the results will soon be published as a separate bulletin. Dr. Garman has also devoted considerable time to a study of the European red mite and other mites and to the chemistry of insecticides.

Dr. Friend has devoted a large portion of his time to a study of the life history, habits and means of control of the Asiatic beetle, *Anomala orientalis,* Waterh., the results of which are

*Resigned September 1
†Beginning September 1

being published as a separate bulletin. He has also worked with certain insect pests of vegetable crops and has continued the investigations on the life history and habits of the imported birch leaf miner, *Fenusa pumila* Klug.

Messrs. B. W. McFarland and J. F. Townsend have been employed throughout the year as field technicians, the former on Asiatic beetle investigations and control and the latter on curculio and Oriental peach moth investigations under Dr. Garman.

Mr. John T. Ashworth has continued to serve as Deputy in charge of gipsy moth control work with headquarters at Danielson. He has been assisted by Mr. McEvoy and the work has been carried on vigorously and efficiently in cooperation with the Federal Bureau of Entomology.

Mr. J. P. Johnson has continued in charge of the scouting and enforcement of the quarantines against the Japanese beetle and the Asiatic beetle. Mr. Johnson is an agent of the Federal Bureau of Entomology, and since January 1, 1928, has maintained an office in the Hurley Building, Shelton, with a force of men sufficient to make the necessary inspections, issue the required certificates, patrol the principal highways leading out of the quarantined area, and in summer, to scout in other towns and cities in Connecticut outside the quarantined area.

Mr. Robert C. Botsford has continued to serve as deputy in charge of mosquito elimination work. He has made preliminary surveys and has supervised important ditching projects in Branford, East Haven, East Lyme, Hamden, Old Lyme and Saybrook, and has maintained the ditches in the other areas which have been accepted for State maintenance.

Mr. J. Leslie Rogers was employed from June 12 to September 22, Mr. H. B. Bender from July 1 to October 1, and Mr. A. F. Clark from July 5 to August 31, assisting Mr. Zappe in inspecting the nurseries.

Mr. Chas. R. Biecher was employed as temporary laboratory assistant from June 18 to September 1.

Mr. Neely Turner, who is engaged on a project for the Crop Protection Institute on horticultural oil sprays, began work November 10, 1927. Office and laboratory facilities are furnished by the Station.

Miss Grace A. Foote has served as Secretary to the department, but resigned September 1, much to the regret of all members of the staff. Her place has been filled by the appointment of Mrs. Gladys Brooke, who was formerly engaged in similar work at the Texas Station. During the summer vacation period, Mrs. A. D. McDonnell, was employed for part time in order to attend to the necessary correspondence.

Messrs. A. W. Yates, Hartford, and H. W. Coley, Westport, have served as apiary inspectors as in former seasons, on a *per diem* basis.

The Entomologist here expresses his thanks and appreciation to all members of the department staff for the faithful and efficient services which they have rendered. The work accomplished would have been impossible without such help.

The Entomologist has given his personal attention to the office correspondence and has directed the research, inspection, control and quarantine work of the Department. He has also served as chairman of a committee on the project on horticultural oil sprays of the Crop Protection Institute, as Associate Editor of the *Journal of Economic Entomology,* and as Insect Pest Reporter in Connecticut for the Insect Pest Survey of the Bureau of Entomology. He is also chairman of the Tree Protection Examining Board, and Superintendent of the Geological and Natural History Survey of Connecticut, and has devoted some of his time to these matters.

The principal activities of the department are given in detail in the following pages of this report.

ENTOMOLOGICAL FEATURES OF 1928

Following a rather mild winter with light snow fall and not excessively low temperatures, the growing season opened with cool weather and scanty rainfall and the spring development of most kinds of insect life was later than usual. During June, July and August, precipitation was frequent and abundant and higher temperatures prevailed. Perhaps the most outstanding entomological features of the season were the expected appearance of Brood II of the periodical cicada or 17-year locust, the discovery of additional infestations of the Japanese beetle at Hartford, New Haven, New London, and a much larger one at Springfield, Mass., and the extensive spread of the European corn borer.

The writer is indebted to Mr. M. P. Zappe of the Department staff for some of the notes on fruit insects and to Mr. A. E. Wilkinson, Vegetable Specialist of the Extension Department, Connecticut Agricultural College, Storrs, for much of the information regarding the prevalence of insects attacking vegetable crops.

Fruit Insects

The Eastern tent-caterpillar, *Malacosoma americana* Fabr., has now passed the peak of its greatest abundance and is on the wane. Though nests were numerous in some localities, they were less abundant than in 1927 and we expect fewer nests in 1929.

The apple and thorn skeletonizer, *Hemerophila pariana* Clerck, is still present and evidence of its work could be found in nearly every orchard, but it does no real damage. Apparently natural enemies are holding it in check.

The grape-vine flea-beetle, *Haltica chalybea* Ill., caused considerable injury to grape-vines in Glastonbury and Bolton in May by eating off the buds. Cutworms also caused similar injury at Glastonbury May 22, and at Windsor Locks May 14.

A prominent fruit pest in 1928 was the Oriental peach moth, *Laspeyresia molesta* Busck, which caused great injury to peaches and quinces in the central and southern portions of the State. Specimens in quince were received from Meriden, October 1. Wherever peaches are grown commercially, there is usually damage, and as yet no satisfactory remedy has been discovered.

On June 19, specimens were received from Canaan of the comparatively rare Say's blister beetle, *Pomphopoea sayi* Fabr., which was feeding upon peach foliage.

The ever-present codling moth, *Carpocapsa pomonella* Linn., was moderately abundant in 1928, but good control was obtained in sprayed or dusted orchards.

The only evidence seen of the presence of the lesser apple worm, *Laspeyresia prunivora* Walsh, were specimens of injury received from Norwalk, October 29.

The plum curculio, *Conotrachelus nenuphar* Hbst., was very late in emerging from winter quarters but was present in apple orchards in the usual numbers, and caused the characteristic scars on the fruit. Specimens of injury to apple were received from Beacon Falls, July 2; Bridgeport, July 5, and to pear and apple from Norwalk, September 15. In Hamden, from 18-33 per cent of the early maturing larvae were parasitized by *Triaspis curculionis* Fitch, but the average parasitism was only five per cent.

The apple maggot or "railroad worm", *Rhagoletis pomonella* Walsh, was present in about the average numbers and caused some damage, particularly on early maturing sweet and subacid varieties which did not receive the July treatments. Specimens of injury were received from Norwalk, October 29.

The apple budmoth, *Tmetocera ocellana* Schiff., was apparently less abundant than usual.

The red-humped caterpillar, *Schizura concinna* S. and A., feedling on apple foliage was received from Norwich, July 19 and Woodstock, September 18.

The hag moth caterpillar, *Phobetron pithecium* S. and A., was more prevalent than usual, and specimens on apple were received from Meriden, August 21; Shelton, September 18, and on pear from Hartford, August 23.

The fall cankerworm, *Alsophila pometaria* Harris, a pest of orchards, shade and woodland trees, mentioned elsewhere in this report was as usual locally abundant in 1928. Eggs were received from Bridgeport, January 20, and adults from Madison, December 6.

Certain noctuid larvae called green fruit worms and usually of the genus *Xylina* often cause considerable injury by eating into the growing fruit, especially apples. Specimens were received from Bridgeport July 5.

A specimen of the larva of *Sphinx drupiferarum* S. and A., feeding on plum foliage, was received from Torrington, July 27.

The imported currant worm, *Pteronidea ribesi* Scop., though not as abundant as in some seasons, was present, and specimens of larvae were received from New Haven, May 8.

Larvae of the crinkled flannel moth, *Lagoa crispata* Pack., were received September 17, from Saybrook Point, where they were feeding upon raspberry.

The European red mite, *Paratetranychus pilosus* C. and F., was present in average numbers, and caused some injury in certain orchards. Eggs of this mite were received from Bantam, April 9, and from Wallingford, February 25.

Another instance of injury to pears by the quince curculio, *Conotrachelus crataegi* Walsh, was received from Branford, August 6. Probably this pest can be partially controlled by spraying with lead arsenate.

The pear midge, *Contarinia pyrivora* Riley caused injury to pears here and there. Specimens were received from Wallingford and New Milford, June 8. No remedy is known other than to gather and destroy the immature pears which will reduce the numbers of the insect the following year.

Leafhoppers, probably *Empoa rosae* Linn., were extremely abundant in apple orchards around Unionville and Southington. Later in the season at Unionville many were killed by a fungous disease.

The pear *Psylla pyricola* Forst., caused less damage than in 1927, though present throughout the State, and was rather abundant in some orchards around New Haven, Stamford, and Wallingford.

Another insect which was absent from most orchards was the apple redbug, *Lygidea mendax* Reut. This insect was observed by our entomologists only at Kensington and Unionville.

An unusual form of injury to peach fruits was observed at the Station, where peach trees are near some oak trees. The fruit was badly punctured by the oak plant bug *Lygus quercalbae* Knight.

Apple aphids (both green and rosy) were rather scarce and caused little injury to fruit.

The woolly apple aphid, *Eriosoma lanigerum* Hausm., was present in usual numbers. The characteristic galls caused by this insect were received from Bridgeport, January 20; Wallingford, February 25, and Noank, June 20.

The currant aphid, *Myzus ribis* Linn., was present as usual and caused the terminal leaves to become blistered or curled. Specimens were received from New Haven, May 10.

The San José scale, *Aspidiotus pernicosus* Comst., was comparatively scarce, and though found in 30 different nurseries, there seems to be no injury from this insect in well-conducted orchards.

The European fruit scale, *Lecanium corni* Bouché, which may attack a variety of trees and shrubs was received on grape-vine from Bridgeport June 5, and New Haven, August 31.

Vegetable Insects

Cutworms were prevalent throughout the State and caused injury to vegetable crops. Damage was reported from Norwich, April 11, Brooklyn, Canterbury, Danielson, Hampton and Wauregan, May 14, and Woodstock May 15. Some growers have used a poisoned bran mash, and their plants were not badly damaged.

The corn ear worm, *Heliothis obsoleta* Fabr., was scarce or absent from most fields of late maturing corn. Not a single report of the appearance of this insect was received at the Station.

The stalk borer, *Papaipema nitela* Guen., seems to be present each year. In 1928 it was rather more abundant than usual and was reported in corn from Wethersfield, July 18, Madison, July 24, Meriden July 35, Thomaston, August 21. It was received in pepper from Stafford Springs, July 20. It was very destructive to corn in a small section of Wethersfield.

The asparagus beetle, *Crioceris asparagi* Linn., is also prevalent nearly every season throughout the State. Reports were received as follows: Farmington, May 21; Huntington where one-third of the crop was seriously injured, June 5; Ridgefield and vincinity, June 6; Thompsonville, Bristol and Southington, June 14.

The striped cucumber beetle, *Diabrotica vittata* Fabr., caused the usual amount of injury throughout the State. At the Station farm at Mount Carmel, it was more amundant and destructive than in 1927.

A troublesome pest of potato and tomato plants is the potato or cucumber flea beetle, *Epitrix cucumeris* Harris, and the season of 1928 was no exception in this regard. The following reports of injury were received; Green's Farms District, June 5; Ridgefield and Danbury region, 10 acres inspected, 10,000 plants injured June 6, Litchfield County, Bethlehem, Morris, Northfield, Thomaston, Watertown and Winchester, tomatoes and potatoes, June 7.

Cabbage insects were abundant during the season. The imported or green cabbage worm, *Pontia rapae* Linn., was so

destructive to cauliflower that one of the largest growers discontinued growing the crop for the season.

The cabbage looper, *Autographa brassicae* Riley, was also present and also contributed toward the damage.

The diamond-back moth, *Plutella maculipennis* Curtis, was present in nearly every cabbage field in New London, Tolland, and Hartford Counties, and caused some injury.

In a field at Norwich, investigated May 10 by Dr. Friend, the cabbage plants had been considerably injured by the horseradish flea beetle, *Phyllotreta armoraciae* Koch. Horseradish had been grown on the field the preceding year. Spraying with lead arsenate will probably control all of the four insects just mentioned.

Specimens of the cabbage curculio *Ceutorhynchus rapae* Gyll., were in the stems of cabbage plants from Orange, June 21. This insect usually breeds in hedge mustard, Shepherd's purse, and wild pepper grass.

Probably the most serious injury to cabbage plants was caused by the cabbage maggot, *Hylemyia brassicae* Bouché. Injury was reported as follows: Mount Carmel, Foxon, and Westville, May 21; Westport, June 6; New London County, June 13; Bristol, Southington and Thompsonville, June 14; Orange, June 21. At Southington 4,000 out of 6,000 plants were destroyed, but the remainder were saved by treating with corrosive sublimate. At Bristol, two applications of corrosive sublimate gave good control, and without the treatment only one plant remained out of fifty.

Cauliflower plants at Southington were injured by a species of thrips, probably the tobacco thrips, *Thrips tabaci* Linde. Mr. Walden visited the field September 14, and advised dusting with nicotine dust.

The cabbage aphid, *Brevicoryne brassicae* Linn., was not generally prevalent during the season, but a few specimens were received from Orange, June 21.

The carrot rust fly, *Psila rosae* Fabr., is evidently becoming more prevalent as its work is now frequently observed on carrot and parsnip in the markets. Specimens were received from Norfolk, April 5, and October 1.

The spinach leaf miner, *Pegomyia hyoscyami* Panz., was not prevalent in 1928. It was present in some fields in June but entirely disappeared later.

The gray field slug, *Agriolimax agrestis* Linn., was reported as injuring tobacco plants in seed beds, June 27.

In general aphids were not very troublesome in 1928, on vegetable crops and not a single report was received of injury by the pea aphid, *Illinoia pisi* Kalt., or by the potato aphid, *Macrosiphum solanifolii* Ashm.

The European corn borer, *Pyrausta nubilalis* Hubn., has spread rapidly during the season and was found by Federal scouts in some 25 towns not previously known to be infested. Most of these are in the eastern end of the State and will be described more fully in another place in this report.

Shade and Forest Tree Insects

Sawfly larvae were rather abundant on conifers during the season. Cocoons of *Diprion simile* Hartig were received from New Haven, April 23; larvae on pine from Hamden August 18 and 25, and from Norwichtown, September 5. *Neodiprion lecontei* Fitch, was more abundant than for several years and was received from Greenwich on two-needled pine September 28. In Branford, Plainville and Unionville, many small pitch trees were completely defoliated but on the larger trees, some leaves remained. *Neodiprion pinetum* Norton was received from North Stonington October 5.

The elm sawfly, *Cimbex americana* Leach, was received from Danbury and Watertown, August 27, and from Norfolk, September 20. Spraying with lead arsenate is the remedy if any of the sawflies mentioned above become injuriously abundant.

The white-marked tussock moth, *Hemerocampa leucostigma* S. and A., in its larval stage feeds upon various deciduous trees. A larva of this species on maple was received from Litchfield, August 13. The tessellated tussock moth, *Halisidota tessellaris* S. and A., was received on sugar maple from New Haven, August 31. The former often defoliates trees particularly in towns and cities. Spraying with lead arsenate is the remedy.

The fall cankerworm, *Alsophila pometaria* Harris, was very abundant in woodland areas in Ridgefield in 1928, and there was an area of several hundred acres just west of the mouth of the Connecticut River, where the woodland trees were almost completely defoliated. Of course, spraying with lead arsenate will prevent defoliation.

The green elm leaf beetle, *Haltica ulmi* Woods, was very abundant at Sound Beach late in the season and the adults could be gathered by the pailful. Specimens were received December 6. Spraying with lead arsenate is the remedy.

The pine tube maker, *Eulia pinatubana* Kearf., has the peculiar habit of fastening together the needles in a cluster to form a protecting case for the larva which devours the distal portion of the needles. This insect was received from New Haven, August 31. In case of severe attacks, the remedy is to spray with lead arsenate.

The fall webworm, *Hyphantria cunea* Drury, was very abundant in the eastern portion of the State.

A Chrysomelid beetle, *Dichelonyx elongata* Fabr., feeding upon oak was received from Cos Cob, June 1. This is a rather common species, with feeding habits and injury to foliage similar to those of the rose chafer. A spray of lead arsenate is the remedy.

The imported willow leaf beetle, *Plagiodera versicolora* Laich., has now spread over the entire State, and was observed in 27 different nurseries during the summer Both adults and larvae feed upon the foliage of glossy-leaved species of willow and sometimes on poplar. During the season, specimens of this insect were received from Greenwich, two adults, January 12; West Haven, June 30, and Colebrook, July 3. Spraying with lead arsenate is the remedy.

Curious balls of frass are often noticed on pine branches. These balls are often two inches or more in diameter, though sometimes smaller. Inside the ball in silken tubes are light brown larvae with darker brown stripes running lengthwise. The adult of this insect is a brown moth, *Tetralopha robustella* Zeller, a species formerly considered rare, but which now seems to be rather common. Specimens of larvae were received from Hartford, May 7.

During the season several leaf-miners have been brought to our attention. One of the most conspicuous of these is the birch leaf-miner, *Fenusa pumila* Klug, which forms blotch mines in the tender terminal leaves of gray birch, European white birch, and its cut-leaf variety, and to some extent in paper birch. Specimens were received from Norwalk, June 20, and from New Haven, July 24. It was observed in 58 different nurseries and is now distributed throughout the State and probably throughout New England. No remedy or preventive has been discovered.

The blotch oak leaf-miner, *Lithocolletis hamadryadella* Clem., was received from Cromwell, August 7.

The larch leaf-miner or case bearer, *Coleophora laricella* Hubn., has caused injury to the native larches in the swamps and to cultivated trees in parks and on home grounds. The larva is a miner inside the leaf. Trees which are severely infested present a very ragged appearance. Specimens of the winter cells were received from Stamford, October 16. These winter cases are fastened to the twigs throughout the winter. The remedy is to spray during the first week of April, using liquid lime-sulphur, diluted at winter strength, one part in nine parts water.

A leaf-miner of spruce, *Recurvaria* sp. was received from Hartford, February 29.

The arborvitae leaf-miner, *Argyresthia thuiella* Pack., which caused so much injury around New Haven in 1920-1922 is now present in injurious numbers in a region just South of Waterbury, and specimens were received from Union City, May 24. There is

no good remedy but some measure of control will result in spraying with nicotine solution and soap, the last week of May and the first week of June, when the adults are flying about and depositing eggs.

Two species of mites have been prevalent during the season and injured or disfigured trees. The spruce mite, *Paratetranychus ununguis* Jacobi, is found on spruce and other conifers, and often causes serious injury. The individuals feed upon the leaves causing them to turn gray or brown and often web together the leaves and twigs. We have been recommending a spray of linseed oil emulsion, but expect to carry on tests of other sprays next season to ascertain a better method of control. Specimens of this mite were received on spruce from Clinton, August 8, and on arborvitae from Bridgeport, October 10; Lyme, October 13, and Newtown, October 16.

The other mite, *Phyllocoptes quadripes* Shimer, forms galls on leaves of silver maple, called the maple bladder gall. Specimens were received from Cromwell, May 23; New Canaan, May 29; Hartford, June 14; Wethersfield, June 19, New Hartford, June 25; Waterford, July 27, and Woodmont, August 10. According to Herrick*, a dormant spray of liquid lime-sulphur 1-8 in April proved to be an effective remedy.

Certain insects form galls on shade and forest trees and may be mentioned here. The horned oak gall, *Andricus cornigerus* O. S., was received from Woodbridge, June 21. The oak pea gall, *Philonix pezomachoides* O. S., was received from Cromwell August 7. The oak fig gall, *Biorhiza forticornis* Walsh, was received from Niantic, August 11. A psyllid gall, *Pachypsylla celtidis* Riley, on hackberry was received from Fairfield, July 10. A rather large aphid gall, *Pemphigus ulmifusus* Walsh, on slippery elm was received from Short Beach, Branford, July 11, and the vagabond poplar gall, *Pemphigus vagabundus* Walsh, on poplar was received from Middletown, July 26.

Other aphid galls which have been common are the spruce gall, *Adelges abietis* Linn., found in 75 different nurseries, and the blue spruce gall, *Gillettea cooleyi* Gillette, found in 45 different nurseries. Specimens of the former on Norway spruce were received from Riverside, November 5, and specimens of the latter on Colorado blue spruce were received from New Canaan, June 7, August 6, and September 8; New Haven, June 18; Waterford, July 27; Middletown, August 27; Bridgeport, September 15, and Stamford, October 16. Both these species may be controlled by spraying between April 1-15, with a contact spray such as a miscible oil (1-25) or a nicotine soap solution to kill the over-wintering females on the twigs.

*Journal of Economic Entomology, Vol. 18, p. 632, 1925.

Two aphid galls were received on hickory. The hickory leaf stem gall aphid, *Phylloxera caryaecaulis* Fitch, was received from West Haven and Norwalk, June 20. Another species, *Phylloxera rimosalis* Pergande, was received from New Haven, June 12. Both species make galls on the leaf petioles. Remedies have not been worked out.

The pine bark aphid, *Adelges pinicorticis* Fitch, which is responsible for the appearance of cotton or wool on the twigs and bark of white pine was received from Lyme, May 10; Bridgeport, August 6, and New Haven, August 31.

A large aphid, *Longistigma caryae* Harris, was received on hickory from Norwich, September 12.

The pine spittle bug, *Aphrophora parallela* Say, was common in midsummer and formed frothy masses or spittle balls on pine twigs. Specimens were received from Bristol, July 7.

A leafhopper, *Idiocerus scurra* Germar, was reported as being very abundant on a Lombardy poplar tree in New Haven, August 10, and specimens were brought to the Station.

Several species of scale insects were common on shade trees in 1928. The oak gall scale, *Kermes* sp., was received from Cromwell, August 7. The pine leaf scale, *Chionaspis pinifoliae* Fitch, was received from Southington, May 18. The white elm scale, *Chionaspis americana* Johnson, on elm was received from New Haven, February 23. The cottony maple scale, *Pulvinaria vitis* Linn., is rather common on red and silver maple in certain regions. Specimens were received from Hartford, June 29; West Haven, June 30; East Hartford, July 17, and Sound Beach, July 23. The tulip tree scale, *Toumeyella liriodendri* Gmel., was rather abundant during the season on tulip tree and magnolia. Specimens were received on magnolia from New Haven, July 25, and Hamden, September 13, and on tulip tree from Waterbury, August 28, and Georgetown, October 23.

The white pine weevil, *Pissodes strobi* Peck, continues to cause great injury to specimen trees and forest plantings where the young trees are not shaded. Specimens were received from Portland, June 8; Somers, July 17, and Westport, August 13. A closely related species, *Pissodes approximatus* Hopkins, seemed to cause the death of red pines planted in Goshen.

A bark borer, *Phlocosinus dentatus* Say., was received in red cedar from Greenwich, March 30, and in red cedar and arborvitae from West Cornwall, September 24.

The hickory bark beetle or bark borer, *Scolytus quadrispinosus* Say., was received from Cos Cob, March 23. The hickory borer, *Cyllene caryae* Gahan, was received from Suffield, May 7.

The twig pruner, *Hypermallus villosum* Fabr., was received from Mystic, August 3, and Watertown, August 15. Another common twig borer, *Phymatodes variabilis* Fabr., was received from Stamford, May 25.

The poplar and willow curculio, *Cryptorhynchus lapathi* Linn., was received from West Haven, June 30 and July 2.

The pigeon horn-tail, *Tremex columba* Linn., was rather abundant in dying trees in Meriden, and specimens were sent to the Station, September 14.

The leopard moth, *Zeuzera pyrina* Linn., was received from East Haven, November 14, 1927.

The European pine shoot moth, *Rhyacionia buoliana* Schiff., is becoming prevalent in red Scotch, and other pines in various regions of the State. Specimens were received in either Austrian or Caucasian pine from Rainbow, November 23, 1927, in Scotch pine from Hartford, May 7, and from Norfolk, September 17, in red pine from Hampton, August 30, and from Stamford, October 16. A closely related species, *Evetria comstockiana* Fern., in pine was received from Bristol, July 7.

The periodical cicada or 17-year locust, *Tibicina septemdecim* Linn., appeared in Connecticut as expected and caused some injury to shade and woodland trees where eggs were deposited in the twigs and branches. Some of these twigs break off and there were small areas around Meriden and New Britain and probably in other sections of the State where the hillsides were brown in July and following, from the broken branches.

Insects Infesting Ornamental Shrubs and Vines.

The juniper webworm, *Dichomeris marginellus* Fabr., has been very prevalent and the larvae webs together the leaves on a twig and feeds upon the leaves inside the web. It is more apt to injure plants of the low juniper *Juniperus communis* and the Irish juniper variety *hibernica,* than the common red cedar *Juniperus virginiana.* Specimens were received from New Haven, April 23, and Newtown, June 29. An affective remedy consists in thoroughly spraying the foliage with lead arsenate. A similar injury to blue spruce was caused by the larvae of a noctuid moth, *Epizeuxis aemula* Hubn., at Woodmont, early in July.

The privet leaf roller, *Archips rosana* Linn., was unsually abundant in certain localities around New Haven, and one hedge presented a very ragged appearance where partially defoliated. Specimens were received from New Haven, June 5 and 7. The oblique-banded leaf roller, *Archips rosaceana* Harris, was also very prevalent and caused injury to roses in many gardens. Specimens were received from New Haven, June 14. Spraying with lead arsenate is a remedy for both these leaf-rollers.

The eight-spotted forester, *Alypia octomaculata* Fabr., feeding upon Virginia creeper was received July 13. Several larvae were nearly full grown. Grapevines and Virginia creeper were nearly stripped in two sections of New Haven. This insect may be controlled by a spray of lead arsenate.

The rhododendron borer, *Sesia rhododendri* Beut., was received from Plantsville, August 30.

The oyster-shell scale, *Lepidosaphes ulmi* Linn., is commonly found on lilac, often killing certain stems or branches. Specimens were received from New Haven, February 23, and from Hamden, September 13.

One of the mealy flatas, *Ormenis pruinosa* Say., is often rather abundant on privet, Japanese barberry and other ornamental plants, though it is questionable whether it causes much injury. Specimens were received from Norwalk, August 13.

The witch hazel cone-gall aphid, *Hormaphis hamamelidis* Fitch, is responsible for the cone-shaped galls on the upper surface of the leaves of witch hazel. Specimens were received from Essex, June 21.

The azalea scale, *Eriococcus azaleae* Comst., is rather common at times on azalea and rhododendron around New Haven. Specimens were received from Hartford, June 4, on rhododendron.

The rose weevil, *Rhynchites bicolor* Fabr., was unusually abundant and injured many rose gardens by eating into the sides of the buds. Specimens were received from New Haven, July 17.

Climbing cutworms, *Xylina* sp., also injured rose buds by eating into them. The writer observed this type of injury in his own garden and specimens were received from Hartford, June 20.

The rose chafer, *Macrodactylus subspinosus* Fabr., was present in most gardens though not as abundant as in some seasons. The beetles feed upon grape and other foliage and upon white rose and paeony flowers. Specimens of the grubs were received from Westport, April 27, and adults from New Haven, June 30.

Insects Attacking Flowers and Greenhouses Plants.

Two mites are common pests of greenhouse plants. One is the bulb mite, *Rhizoglyphus hyacinthi* Banks, which was received from Hartford, March 14, infesting Bermuda lily. The other is known as the cyclamen mite, *Tarsonemus pallidus* Banks, though it injures a number of other kinds of plants both in the greenhouse and in the garden out-of-doors. Specimens were received on larkspur from Hartford, March 20, and New Haven, June 16, and on snapdragon from New Haven, October 29.

The greenhouse whitefly, *Trialeurodes vaporariorum* Westwood, is troublesome on certain plants in dwellings, greenhouses, and even out-of-doors in the summer, throughout the state. Specimens were received on Pelargonium from Norwichtown, May 25. The remedy is cyanide fumigation or a contact spray like nicotine solution and soap.

The four-lined leaf-bug, *Poecilocapsus lineatus* Fabr., often injures various garden plants by sucking the sap from the tender

terminal leaves, causing transparent circular spots and later holes to appear in them. Specimens were received on chrysanthemum from New Haven, June 21, on chrysanthemum and dahlia from Bridgeport, July 9, and on aster, ageratum and *Dianthus* from Orange, July 13. The remedy is frequent spraying during June, with nicotine solution and soap.

Dahlias are also injured by the tarnished plant bug, *Lygus pratensis* Linn., and specimens were received from Eastford, August 14. This bug causes a distortion or dwarfing of the injured shoots, but transparent spots or holes do not follow. The remedy given above should prove effective.

Climbing cutworms were reported as injuring dahlias at Hartford, August 2. One species, *Peridroma margaritosa*, var. *saucia* Hubn., caused considerable injury to carnations in Bridgeport, by eating into the buds. Specimens were received January 20.

The greenhouse leaf-tyer, *Phlyctaenia ferrugalis* Hubn., caused much injury to chrysanthemums in the greenhouse at Elmwood. Specimens were received May 14 and from New Haven, May 24, on heliotrope. Cyanide fumigation of the house or spraying the plants with lead arsenate usually prove effective.

The iris root borer, *Macronoctua onusta* Grote, was received from New Haven, August 13. The larva tunnels in the rootstocks of iris, and should be destroyed whenever found. The adult moth lays late in the fall on the leaves, consequently gathering and burning the iris leaves in early spring is one of the best measures of control.

The zebra caterpillar, *Mamestra picta* Harris, is often a pest of the flower or vegetable garden. The moth lays eggs on the leaves and the young caterpillars begin feeding upon the foliage. Specimens on gladiolus were received from Meriden, July 3.

Insects Injuring Stored Vegetable Products

Stored seeds, cereals and other products are often injured by various insects, some of which are mentioned below.

The black carpet beetle, *Attagenus piceus* Oliv., was received from Hartford, December 27, 1927, in seeds, and again from New Haven, March 20. It is usually as a pest of carpets, rugs and clothing that we hear of this insect, and specimens injuring clothing were received from New Haven March 14.

The museum beetle, *Anthrenus verbasci* Linn., evidently feeds upon both plant and animal products. Specimens were received from Shelton, May 24. Anthrenus larvae which may have been this species were received from New Haven, March 20, feeding on seeds.

The rice weevil, *Calendra oryzae* Linn., was received from Middletown, December 30, 1927, infesting stored corn.

The cigarette beetle, *Lasioderma testaceum* Dufts., was received in bread, from Hartford, January 17.

The cadelle, *Tenebroides mauritanica* Linn., was received in cocoa beans from Stamford, February 9.

The saw-toothed grain beetle, *Oryzaephilus surinamensiss* Linn., and the confused flour beetle *Tribolium confusum* Duval, were received from Stamford, June 20.

The rice moth, *Corcyra cephalonica* Stainton, was reared by Dr. Friend from cocoa dust from a chocolate factory at Stamford. This is the first record of this insect from Connecticut.

Miscellaneous Insects

White ants, *Reticulitermes flavipes* Koll., often infest and injure structural timbers or wood. This insect in the trim of a schoolhouse was received from Suffield, June 5. On August 22, specimens were brought in from the lobby of a theater in New Haven.

The large American cockroach, *Periplaneta americana* Linn., is often found in dwelling houses where it feeds upon the crumbs and waste food materials around kitchen and pantry. Specimens of nymph and adult were received from New Haven, September 27.

The adults of the Asiatic beetle, *Anomala orientalis* Waterh., were more abundant than in 1927, in the infested area, and many lawns were injured by the grubs. In the spring the grubs came to the surface about April 17, two weeks earlier than in 1927. Treating the lawns with lead arsenate, three pounds to 100 square feet, seems to be the best remedy.

The Japanese beetle, *Popillia japonica* Newman, was found to be present in Stamford and Bridgeport in larger numbers than in 1927. Federal scouts found small infestations in New Haven, New London and Hartford, and a larger infestation in Springfield, Mass., only a few miles from the Connecticut line.

According to a report received June 14, wireworms had destroyed three acres of beans at Thompsonville.

The black cutworm, *Agrotis ypsilon* Rott., was recived from Cromwell, August 28, where it was feeding upon the grass on the golf links.

Some of the most important of these insects are treated at greater length in other portions of this report.

Convention of Entomological Workers

The fifth annual convention of entomologists working in Connecticut was held at the Station on Thursday, October 25, 1928. The program was planned to include subjects of vital interest to

Connecticut entomologists, but the following entomologists from outside the State were invited to present papers: L. H. Worthley, Boston, Mass., Dr. Albert Hartzell, Yonkers, N. Y., A. F. Burgess, Melrose Highlands, Mass., and C. H. Hadley, Camden, N. J. Messrs. Worthley, Hadley, Felt and Johnson could not be present and their papers were read by Messrs. Bartley, Sherman, Spicer and Burke. About 42 attended the meeting. Luncheon was obtained at the Yale Dining Hall. The program was as follows:

PROGRAM

A. M.

10:10 Greetings:
W. L. Slate, Director, Experiment Station, New Haven.

10:15 Progress in Mosquito Ditching in Connecticut in 1928:
R. C. Botsford, New Haven.

10:30 Some Entomological Features of the Season of 1928:
Dr. W. E. Britton, New Haven.

10:45 Some Injurious Shade-Tree Insects in 1928:
Dr. E. P. Felt, Stamford.

11:15 New Phases in the Spread and Control of the European Corn Borer
L. H. Worthley, Boston, Mass.

11:45 Experiments with Oil Mixtures in Killing the Eggs of the European Red Mite:
Dr. Philip Garman, New Haven.

12:00 General Properties of Oil Sprays:
Neely Turner, New Haven.

P. M.

12:15 Naphthalene Fumigation:
Dr. Albert Hartzell, Yonkers, N. Y.

12:30 Luncheon.

2:00 Glimpses of the Fourth International Congress of Entomology held at Ithaca, N. Y., Aug. 12-18:
Prof. J. A. Manter, Storrs.

2:30 The Gipsy Moth and the Satin Moth:
A. F. Burgess, Melrose Highlands, Mass.

3:00 Present Status of the Japanese Beetle in the United States:
C. H. Hadley, Camden, N. J.

3:30 Some Aspects of Japanese Beetle Quarantine Enforcement in Conn.:
J. P. Johnson, Shelton.

3:45 Control of the Asiatic Beetle:
Dr. R. B. Friend, New Haven.

4:00 Notes on Nursery Inspection in Connecticut:
M. P. Zappe, New Haven.

The following were present: J. T. Ashworth, Danielson, Conn.; Harold L. Bailey, Bradford, Vt.; H. N. Bartley, Bridgeport, Conn.; R. C. Botsford, New Haven, Conn.; W. E. Britton, New Haven, Conn.; A. F. Burgess, Melrose Highlands, Mass.; G. W. Burke, Shelton, Conn.; W. A. Collins, New Milford, Conn.; Harry E. Cooke, Torrington, Conn.; O. B. Cooke, Danielson, Conn.; R. G. Cooper, Colebrook, Conn.; S. S. Crossman, Melrose, Mass.; C. M. Emerson, Hartford, Conn.; R. B. Friend, New Haven, Conn.; Philip Garman, New Haven, Conn.; R. D. Glasgow, Albany, N. Y.; Harold C. Hallock, Westbury, N. Y.; Albert Hartzell, Yonkers, N. Y.; H. C. Helliwell, Shelton, Conn.; J. W. Kelley, Shelton, Conn.; Dolor LaBelle, Danielson, Conn.; C. Wm. Lacaillade, Jr., Storrs,

Conn.; J. W. Longo, Danielson, Conn.; J. A. Manter, Storrs, Conn.; J. A. McEvoy, Putnam, Conn.; B. W. McFarland, New Haven, Conn.; H. L. McIntyre, Albany, N. Y.; Saul Phillips, Albany, N. Y.; F. C. Rich, Ansonia, Conn.; John O. Schread, Storrs, Conn.; A. F. Schulze, Storrs, Conn.; R. W. Sherman, Camden, N. J.; Wm. L. Slate, New Haven, Conn.; M. D. Smith, Darien, Conn.; R. A. Spencer, Bloomfield, Conn.; O. W. Spicer, Stamford, Conn.; A. E. Stene, Kingston, R. I.; J. F. Townsend, New Haven, Conn.; Neely Turner, New Haven, Conn.; B. H. Walden, New Haven, Conn.; T. R. Ward, New London, Conn.; M. P. Zappe, New Haven, Conn.

INSPECTION OF NURSERIES IN 1928

By W. E. Britton and M. P. Zappe

The regular annual inspection of nurseries was commenced July 2, and completed October 1, except for a few nurseries registering late in the season. The work was in charge of Mr. Zappe who was assisted by Messrs. J. L. Rogers, J. F. Townsend, H. B. Bender and A. F. Clark. In a few cases assistance was rendered by E. M. Stoddard, B. H. Walden and W. E. Britton.

Mr. Bender is a botanist who was employed on this work for three months in order to pay special attention to such plant diseases as might be present in the nurseries.

In addition to the examination of the nurseries by the regular nursery inspectors, the gipsy moth scouts were instructed to make extra careful searches for gipsy moth eggs in and around all nurseries within the infested area, and to report immediately to the office in case any were discovered in or near any nursery in 1928. Also, the pine blister rust scouts under Mr. J. E. Riley, examined all nurseries where the blister rust was reported by the nursery inspectors.

On the whole, the nurseries were as well cared for and in as good condition as usual. On account of the abundant rain, leaf spots and other plant diseases were perhaps more in evidence than in some seasons—especially dry seasons. More attention was also given to recording them. On the other hand, aphids were much less prevalent than in 1927. The spruce gall aphids, *Adelges abietis* and *Gillettea cooleyi* are not greatly affected by seasonal or climatic conditions and were present in about the usual numbers; though our records show that each was found in more nurseries than last year; the increase is partly due to the increase in the number of nurseries (37 more than last year). Some nurserymen must make greater efforts to control these pests. Spraying in March or the first half of April, with a contact spray seems to be the best treatment. For this purpose, one may apply either a miscible oil (1-25), or nicotine solution and soap (1-400) equivalent to two teaspoons in a gallon of water with an inch cube of laundry soap dissolved and added as a spreader.

In 18 nurseries no important pests were found. Following is a list of insects and plant diseases found in nurseries during the annual inspection of 1928, together with the number of nurseries infested by each:

Pests Found in Nurseries in 1928

Number of Nurseries Uninfested	18

INSECTS

Name	No. Nurseries
Anisota stigma	1
Aphids, apple, green	40
woolly	60
on birch	1
boxwood	2
cherry	1
Crataegus	1
Cytisus	1
elm	8
fir	1
Heliopsis	1
mountain ash	4
pear	1
phlox	1
pine	4
red pine	1
plum	1
poplar	1
quince	3
rose	1
spirea	4
spruce	1
willow	6
spruce gall aphid	
Adelges abietis	75
Gillettea cooleyi	45
woolly, on pine bark	23
woolly, on beech	1
Apple and thorn skeletonizer	49
Arctiid larvae	1
Birch bucculatrix	1
Borer, ash	1
bronze birch	2
elm	1
Helenium	1
Iris	3
Iris (seed pod)	1
lilac	1
lilac (terminals)	1
mountain ash (terminals)	1
peach	2
poplar (Agrilus)	1
poplar	3
willow	3
Bugs on ash (Capsids)	3
Currant worm imported	3
Cutworms on rhododendron	1
Elm case bearer	7
Elm leaf beetle	3
Epitrix cucumeris	1
European pine shoot moth	7
Fall webworm	22
Four lined plant bug	1

Name	No. Nurseries
Janus abbreviatus	5
Juniper webworm	5
Lace bugs on Azalea	1
Kalmia	1
Rhododendron	48
Leafhoppers on apple	72
cherry	2
maple	1
Japanese maple	1
mountain ash	1
oak	1
pear	2
poplar	1
quince	1
rose	11
Leaf-miner in apple	2
arborvitae	7
beech	1
birch (*Fenusa pumila*)	58
boxwood	5
Catalpa bungei	19
columbine	2
locust	3
tulip tree	1
peach	1
sour gum	1
Leaf roller, privet	2
Mealy bugs, Catalpa	1
Midge on silver maple	11
Mites, European red	15
pear leaf blister	47
spruce	27
on arborvitae	1
birch	1
boxelder	2
fir	1
maple	8
oak	3
phlox	1
willow	5
Mites, galls on buttonbush	1
Oriental peach moth	26
Ormenis pruinosa	1
Otiorhynchus ovatus on arborvitae	1
Otiorhynchus sulcatus on Taxus	2
Pear psylla	23
Pear slug	27
Pistol case bearer	1
Poplar leaf beetle, *Lina scripta*.	2
Psylla on boxwood	3
Red-humped caterpillar	4

Name	No. Nurseries
Sawfly imported pine *Diprion simile*	4
on pine	2
arborvitae	3
dogwood	4
Scale, elm	6
elm scurfy	1
Euonymus	1
juniper	1
Lecanium on currant	1
oak gall	2
oyster shell	57
pine leaf	13
rose	6
San José	30
scurfy	5
tulip tree	1
West Indian Peach	2
Scale, on dogwood	1
Photinia villosa	1
Spiny elm caterpillars	1
Spittle bugs on arborvitae	3
birch	1
juniper	3
linden	1
pine	2
Tarnished plant bug	4
Tulip tree leaf gall	3
Tussock moth larvae	1
Tussock moth eggs	1
White pine weevil	19
Willow curculio	5
Willow leaf beetle imported *Plagiodera versicolora*	27
Yellow-necked caterpillars	5

Plant Diseases

Name	No. Nurseries
Anthracnose cherry	15
currant	18
oak	5
peach	1
poplar	8
willow	1
Apple scab	76
Apple mosaic	18
Bacterial disease larkspur	22
Black knot	6
Black rot, apple	58
Botrytis on *Caragana*	1
paeony	7
Canker, poplar	35
sycamore	1
Crown gall	4
Exoascus on honeysuckle	2
oak	5
Exobasidium on honeysuckle	13
Fire blight	1
Gnomonia ulmi	16
Leaf blotch rose	99
Ampelopsis	9
Leaf spot on Andromeda	1
Azalea	3
barberry	10
Bechtel's crab	1
birch	1
boxelder	18
boxwood	1
Carya	1
Catalpa	74
cherry	5
Leaf spot on dogwood	4
elm	8
English ivy	7
ginkgo	1
gooseberry	1
grape	30
hemlock	3
hollyhock	11
horsechestnut	30
hydrangea	2
Iris	48
Japanese maple	32
juglans	13
Kalmia	11
larkspur	28
lilac	2
linden	2
lupine	1
Liriodendron	1
Mahonia	1
maple	50
tar spot	9
mountain ash	29
oak	4
paeony	1
peach	1
philadelphus	1
phlox	46
Prunus pissardi	1
quince	15
raspberry	3
red bud	1
rhododendron	56

Name	No. Nurseries
Leaf spot on rhubarb	15
strawberry	26
Viburnum	3
Weigelia	1
Yucca	1
Mildew on apple	26
azalea	2
Catalpa	53
cherry	3
chrysanthemum	1
flowering crab apple	1
flowering grape	53
flowering honeysuckle	1
flowering lilac	63
flowering oak	1
flowering peach	1
pear	1
phlox	55
Platanus	1
raspberry	1
rose	49
Mildew on Symphoricarpus	1
Phomopsis juniperi	2
Raspberry cane blight	3
mosaic	12
Rust on Amelanchier	1
apple	68
ash	3
Bechtel's crab	34
Crataegus	18
hollyhock	4
juniper	8
oak	1
pear	5
pine (3 needled)	1
pine needles	2
quince	15
Scab, pear	4
White pine blister rust on pine	3
Ribes	5
Yellowing of lilacs	10

An examination of the preceding list will show that among the insects the spruce gall aphid, *Adelges abietis* as was the case last year was found in more nurseries (75) than any other insect, followed by apple leafhoppers (72), apple woolly aphid (60), birch leaf-miner, *Fenusa pumila* (58), oyster-shell scale (57), apple and thorn skeletonizer (49), rhododendron lace bug (48), pear leaf blister mite (47), apple green aphid (40), San José scale (30), spruce mite (27), imported willow leaf beetle (27), pear slug (27), Oriental fruit moth (26), pear psylla (23), pine bark aphid (23), fall webworm (22), catalpa leaf-miner (19), white pine weevil (19), European red mite (15), and pine leaf scale (13), leafhoppers on rose (11), gall midge on silver maple (11).

Among the plant diseases found in nurseries in 1928, leaf blotch of rose headed the list (99), followed by apple scab (76), leaf spot of catalpa (74), apple rust (68), mildew of lilac (63), black rot of apple (58), leaf spot of rhododendron (56), mildew of phlox (55), mildew of catalpa (53), mildew of grape (53), leaf spot of maple (50), mildew of rose (49), leaf spot of iris (48), leaf spot of phlox (46), poplar canker (35), rust on Bechtel's crab (34), leaf spot on Japanese maple (32), leaf spot on horse chestnut (30), leaf spot on grape (30), leaf spot on mountain ash (29), leaf spot on larkspur (28), leaf spot on strawberry (26), mildew on apple (26), bacterial disease of larkspur (22), currant anthracnose (18), apple mosaic (18), leaf spot on box-elder (18), rust on crataegus (18), *Gnomonia ulmi* on elm (16), cherry anthracnose (15), leaf spot on quince (15), leaf spot on

rhubarb (15), rust on quince (15), leafspot on juglans (13), Exobasidium on honeysuckle (13), raspberry mosaic (12), leaf spot on hollyhock 11, leaf spot on kalmia (11), leaf spot on barberry (10),

As has already been stated, mildews, leaf spots and other plant diseases were favored by the frequent rains, and were probably more abundant than in most seasons.

In order to show the prevalence of certain pests in nurseries in 1928, as compared with 1927, and preceding seasons, a record of them for the past eight years is given in the following table:

EIGHT-YEAR RECORD OF CERTAIN NURSERY PESTS

	1921	1922	1923	1924	1925	1926	1927	1928
Oyster-shell scale	36	44	42	44	38	39	45	57
San José scale	28	19	20	32	32	19	16	30
Spruce gall aphids*	31	21	28	40	27	42	82	120
White pine weevil	1	19	17	5	5	8	17	19
Apple and thorn skeletonizer		1	18	2	8	9	22	49
Poplar canker	21	31	34	25	34	32	39	35
Pine blister rust (on *Ribes*)	2	9	6	8	7	9	9	5
Nurseries uninfested	36	36	32	33	34	46	37	18
Number of nurseries	94	101	106	116	151	162	191	228

It should be understood that the figures in the preceding table are not strictly comparable because of the greater number of nurseries since the new law went into effect in 1925. Thus though the number of infested nurseries is greater, the actual percentage may be considerably less.

NUMBER AND SIZE OF NURSERIES

The number of nurseries in Connecticut has increased each year. The list for 1927 contained 191 names. The list for 1928 contains 228 names. Of the 228 separate nurseries in the State, a classification on account of size may be made as follows:

Nurseries containing 50 acres or more	14
" " between 10 and 50 acres	29
" " " 5 and 10 "	27
" " " 2 and 5 "	58
" " 1 acre or less	100
	228

During the year 1928, 245 nursery inspections were made. The list of nursery firms receiving certificates contains 228 names; nine being new nurseries registered during the winter, and were inspected twice, once in the spring and again in the

*Includes both *Adelges abietis* and *Gillettea cooleyi*.

fall. Seven nurseries which were inspected failed to qualify in time to receive certificates during the year.

The owners of two small nurseries failing to register before July 1, as provided in Section 2, Chapter 265, Public Acts of 1925, a minimum charge of five dollars each was collected and the total amount ($10.00) was sent to the State Treasurer on January 14, 1929. The cost of inspection would have been greater had it been necessary to make a special trip from New Haven to inspect each nursery instead of making the inspection when working in the vicinity. The total area of Connecticut nurseries in 1928 is about 3,194 acres. The figures were taken from the owner's estimates indicated on the registration cards, except in cases where the acreage was not given on the cards, it was estimated by the inspector. Each nursery of less than an acre in extent is listed as one acre, and where fractions are given, the next whole number is recorded. The list of nursery firms receiving certificates in 1928 is as follows:

NURSERY FIRMS IN CONNECTICUT RECEIVING CERTIFICATES IN 1928

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Alius, Adolf	Stamford	1	Dec. 3	760
Allen, Henry L	North Stonington	1	Aug. 21	598
Amelunxen & DeWyn	Yalesville	3	July 26	549
Anderson, E. H	Bloomfield	3	Dec. 31	773
Austin, M. E. (2)	Clinton	1	Sept. 5	638
Barnes Bros. Nursery Co	Yalesville	160	July 26	547
Barnes Eastern Nursery	Wallingford	15	Sept. 17	669
Barnes Nursery & Orchard Co	Wallingford	75	Oct. 11	727
Barton, Robert	Hamden	1	Sept. 5	644
Beattie, W. H	New Haven	1	Aug. 28	618
Beerbaum, Wm. F	Waterbury	3	Oct. 9	725
Benbow, A	Norfolk	1	Oct. 2	708
Bertana, Louis	Glenbrook	2	Aug. 2	563
Bertolf Bros., Inc	Greenwich	45	Aug. 2	564
Birchell, George A	Stonington	2	Dec. 26	772
Booy, H. W	Yalesville	3	July 26	550
Botsford, R. C	East Haven	1	Sept. 27	698
Brainard Nursery & Seed Co.	Thompsonville	15	Sept. 4	634
Braley & Co., S. A	Burnside	4	Aug. 16	582
Branford Nurseries	Branford	4	Sept. 12	662
Bretschneider, A	Danielson	1	Sept. 19	674
Bridgeport Hydraulic Co	Bridgeport	200	Oct. 19	735
Brimfield Gardens Nursery	Wethersfield	2	Sept. 22	684
Bristol Nurseries, Inc	Bristol	40	Sept. 5	636
Brooklawn Conservatories	Bridgeport	1	Oct. 5	719
Brooklawn Nursery (2)	Fairfield	2	Oct. 14	718
Brouwer and Hancock	New London	13	Aug. 15	600
Brown, Edgar M	Hartford	1	Sept. 12	664
Bubenicek, Joseph (2)	Woodmont	1	Oct. 1	706
Buckley, Walter E	Groton	1	Aug. 17	586
Bulpitt, Henry F	Darien	5	Sept. 4	635
Bunting's Nurseries, Inc	Groton	5	Aug. 23	609

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Burke, P. J.	Rockville	1	Aug. 6	570
Burr, Morris L.	Westport	1	Aug. 30	625
Burr & Co., Inc., C. R.	Manchester	500	Aug. 13	580
Burroughs, Thomas E.	Deep River	4	Aug. 8	576
Burwell, E. E.	New Haven	1	Oct. 11	728
Byram Evergreen Nursery	Greenwich	1	Aug. 8	579
Candee, Hollis S.	Wethersfield	6	Oct. 11	726
Cant, Alexander	Springdale	1	Aug. 21	601
Cardarelli, E. J.	Cromwell	2	Sept. 5	637
Case, Louis L.	Simsbury	1	Sept. 25	691
Chapman, C. B.	Groton	1	Aug. 28	619
Chippendale Nurseries	Old Lyme	4	Sept. 25	690
Clark, Raymond H.	Milford	1	Dec. 26	771
Clinton Nurseries	Clinton	10	Nov. 8	742
Clyne, George A.	Middlebury	7	Oct. 25	736
Conine Nursery Co.	Stratford	50	Aug. 2	562
Conn. Agr. College (Prof. S. P. Hollister)	Storrs	1	Dec. 20	765
Conn. Agr. Expt. Station (W. O. Filley, Forester)	New Haven	2	Dec. 10	763
Conn. Valley Nurseries	Manchester	10	Aug. 6	567
Corrigan, James J.	West Haven	1	Sept. 5	640
Cragholme Nurseries	Greenwich	8	July 28	558
Cromie, G. A.	New Haven	1	Oct. 26	738
Dallas, Inc., Alexander	Waterbury	3	Sept. 17	671
Darien Nursery	Darien	2	Aug. 16	584
Dawson, William A.	Willimantic	2	Aug. 22	607
Dunlap, Daniel S.	Cromwell	3	Aug. 22	606
Dunn, James F.	Stamford	2	Aug. 8	578
Dougherty, James	Yalesville	1	Aug. 21	602
Eager, Edward M.	Bridgeport	1	Aug. 31	630
East Rock Park Nursery	New Haven	1	Sept. 28	705
Eells and Sons	Manchester	1	Aug. 6	574
Elfgren and Sons, I. P.	East Killingly	1	Aug. 17	589
Elm City Nursery Co. (Woodmont Nurseries, Inc.)	Woodmont	120	Sept. 4	633
Elm Grove Cemetery Assoc.	Mystic	1	Oct. 8	720
Ensign-Bickford Co. (S. W. Eddy, Supt.)	Avon	5	Nov. 26	751
Evergreen Nursery Co.	Wilton	15	July 28	557
Fairty, C. H.	New Canaan	2	Aug. 16	585
Farmington Valley Nursery (Harry D. Wilcox, Prop.)	Avon	2	Sept. 28	702
Flower City Rose Co.	Manchester	20	Aug. 6	569
Fraser's Nurseries & Dahlia Gardens	Willimantic	3	Oct. 2	714
Gardner's Nurseries	Rocky Hill	75	Sept. 11	659
Geduldig's Greenhouses	Norwich	8	Aug. 29	623
Giandomenico, R. Di	Middletown	1	July 26	553
Gilbert and Bruce	Killingly	1	Aug. 17	587
Giuliano, J. S.	Wethersfield	1	Sept. 25	692
Glen Terrace Nurseries (Jas. H. Everett, Prop.)	Mount Carmel	25	Dec. 3	761
Golden Hill Nursery (Andrew Johnson, Prop.)	Shelton	2	Nov. 15	745
Goodwin Nurseries	Bloomfield	7	Oct. 8	722
Grillo, N.	Milldale	1	Aug. 29	624

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Hamden Nursery (John Carolla, Prop.)	Hamden	1	Oct. 9	723
Hansen, Peter	Fairfield	7	Sept. 18	673
Hawes, Frank M	West Hartford	1	Sept. 12	663
Hearn, Thomas H	Washington	2	Aug. 25	612
Heath and Co	Manchester	7	Aug. 6	568
Henninger, Christ	New Britain	1	Sept. 24	689
Hilliard, H. J	Sound View	1	Sept. 22	686
Hiti Nurseries	Pomfret Center	8	Aug. 23	608
Holcomb, H. Parks	Winsted	1	Nov. 27	754
Holcomb, Irving	Granby	1	Aug. 6	575
Holdridge, S. E	Ledyard	3	Aug. 21	597
Horan, James F	Hartford	3	Dec. 1	759
Horan and Son, James	Bridgeport	1	Nov. 26	749
Houston, Byron D	Mansfield	15	Oct. 16	732
Hoyt, Chas. E. (2)	Danbury	2	Sept. 5	642
Hoyt's Sons Co., Inc., Stephen	New Canaan	500	Aug. 3	565
Hull, Curtis M	Wallingford	3	Sept. 27	696
Hunt and Co., W. W	Hartford	8	Sept. 10	656
Huntoon, Gerald W	Rocky Hill	1	Sept. 12	665
Innes, William	Milford	2	Nov. 15	744
Intravaia, Joseph	Middletown	1	July 26	554
Jankovich, Joseph	Plantsville	1	Sept. 7	650
Jennings, G. S	Southport	1	Aug. 28	621
Joel Nursery Co	Wallingford	5	Nov. 27	755
Johnson, Tom	Stratford	1	Aug. 31	629
Judd, T. H	Danbury	1	Dec. 13	764
Kauser, Alice	Norwalk	1	July 28	560
Kelley & Son, James J	Darien	5	Sept. 10	653
Kennedy, Mary H. (2)	East Hartford	1	Aug. 6	571
Kerner, Eugene	Woodbury	1	Dec. 22	768
Keystone Nurseries (H. H. Kellner, Prop.)	Danbury	1	Sept. 5	643
Langstroth Conifer Nursery	Danbury	4	Aug. 3	626
Leghorn, John J	Cromwell	10	Aug. 22	605
Lewis & Valentine, Inc	Darien	11	Aug. 18	591
Liljenstein, Carl	New London	1	Aug. 17	588
Lundberg, E. A	Darien	1	Aug. 8	577
MacKeever, Frank C	Rowayton	1	Aug. 28	620
Malavasi, Sam	Woodbridge	3	Oct. 3	717
Mallett, George A	Bridgeport	5	Sept. 20	681
Maplewood Nursery Co. (F. M. Oat, Mgr.)	Norwich	3	Dec. 24	770
Marigold Farm (Henry Kelley, Prop.)	New Canaan	10	Sept. 13	667
Mars, F. H. De (2)	Winsted	1	Oct. 2	709
Mason, Warren S	Farmington	1	Sept. 5	645
Mayapple Nurseries (Paul M. Barrows, Prop.)	Stamford	1	Aug. 24	611
Maynard and Gadbois	Old Lyme	1	Dec. 21	766
McConville, John	Manchester	1	Aug. 6	575
Meachen, George C	Stratford	1	Oct. 1	707
Meier, A. R	West Hartford	1	Nov. 28	757
Merwin Lane Nursery	Greenfield Hill	6	Sept. 12	661
Meyer, Ludwig	Bridgeport	1	Sept. 28	704
Middeleer, Inc	Darien	20	Sept. 19	675
Millane Nurseries	Cromwell	20	Sept. 27	695

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Minge, C. H	Rocky Hill	1	Oct. 9	724
Moraio Bros	Stamford	5	Aug. 29	622
Moulthrop, William	Watertown	3	Sept. 7	651
Mount Airy Gardens (R. L. Wilson, Prop.)	North Stamford	1	July 28	561
Mount Carmel Nursery	Mount Carmel	1	Sept. 27	697
New Britain Board of Water Commissioners	New Britain	50	Sept. 24	688
New Haven Nurseries (L. A. Soldan, Mgr.)	New Haven	1	Oct. 31	741
New Haven Park Commission (G. X. Amrhyn, Supt.)	New Haven	20	Sept. 17	670
New London Cemetery Association	New London	1	Oct. 17	734
New London County Nurseries	New London	8	Oct. 3	716
New York, New Haven and Hartford Railroad Co. (C. H. Haggerty)	Stamford	5	Oct. 3	715
Nicholson & Thurston	Litchfield	1	Aug. 28	617
Northeastern Forestry Co.	Cheshire	66	July 26	546
Norwood Nursery	Hamden	1	Sept. 7	652
Oakland Nurseries	Manchester	20	Aug. 18	590
Old Orchard Nursery (R. G. Hanford, Prop.)	Norwalk	3	Nov. 26	750
Ostergren, Herbert	Cromwell	2	Aug. 22	604
Outpost Nurseries	Ridgefield	90	Sept. 10	657
Ouwerkerk, D. K	Yalesville	10	July 26	552
Park Gardens	Bridgeport	1	Sept. 24	687
Park Place Nurseries (R. E. Upson, Prop.)	Marion	5	Sept. 25	693
Patrick, Charles	Bridgeport	1	Nov. 26	752
Pedersen, Anthon	Stamford	2	Sept. 22	683
Pequod Nursery Co	Yalesville	15	July 26	548
Peschko, Robert	Danbury	1	Aug. 30	627
Phelps and V. T. Hammer Co., The J. W	Branford	3	Sept. 27	700
Phillips, Alice G	Milton	1	Oct. 2	711
Pierrepont, Seth L	Ridgefield	12	Dec. 22	769
Pierson, Inc., A. N	Cromwell	150	Aug. 24	610
Pinatello, Michael	East Hartford	2	Nov. 26	748
Pinchbeck Bros., Inc	Ridgefield	3	Sept. 17	668
Polish Orphanage Farm	New Britain	1	Oct. 29	739
Pomeroy Blue Spruce Gardens	New Milford	5	Aug. 25	613
Prospect Nurseries (S. C. Hubbard, Prop.)	Cromwell	5	Sept. 6	646
Prudence Seymour Gardens (Mary T. Parfitt, Prop.)	New Milford	1	Aug. 28	614
Rabinak, Louis	Deep River	1	Oct. 8	721
Rengerman, A. B	Granby	1	Sept. 10	655
Reynolds, Stephen	South Norwalk	1	July 27	556
Richmond, Gordon L	New Milford	1	Aug. 28	615
Rockfall Nursery Co	Rockfall	80	Sept. 6	648
Rottenberg, Julius	Newington	1	Sept. 28	703
Russell, C. B	Newington	1	Sept. 19	678
Sage, Hollister	Woodbury	1	Sept. 7	649
Sargeant, Mrs. A. R	Tolland	1	Aug. 6	566

Name of Firm	Address	Acreage	Certificate Issued	No. of Certificate
Saxe-Floto	Waterbury	1	Oct. 31	740
Schaeffer Bros	Ledyard	3	Aug. 21	596
Scheepers, Inc., John	Stamford	10	July 26	555
Schulze, Charles T	Bethel	2	Nov. 27	753
Scott's Nurseries	Bloomfield	4	Nov. 27	756
Seltsam, George	Bridgeport	1	Sept. 19	680
Seymour, Fred R	Riverton	2	Oct. 2	710
Shailer, Edwin E. (2)	Haddam	1	July 28	559
Shelton, Philo S	Fairfield	4	Sept. 19	677
Sierman, C. H	Hartford	8	Oct. 2	713
Simonsen, H. C	Plainville	3	Dec. 10	762
Snelgrove, S. J	Windsor	2	Aug. 31	632
Soltes, Martin	Shelton	1	Nov. 13	743
Southport Nursery (Coari & Sons, Props.)	Southport	20	Sept. 12	666
South Wilton Nurseries (J. C. Van Heiningen, Prop.)	South Wilton	4	Aug. 14	581
Spencer, W. L. L. (2)	Columbia	1	Aug. 22	603
Spring Nurseries (H. C. Barnes, Prop.)	Bristol	2	Sept. 5	639
State of Connecticut (A. F. Hawes, State Forester)	Simsbury	5	Sept. 10	654
State Street Nursery (John Natyzon, Prop.)	New Haven	2	Sept. 12	660
Steck, Charles A	Newtown	8	Sept. 6	647
Steck, Jr., Charles A	Bethel	2	Oct. 15	730
Steck, Harold W	Farmington	10	Oct. 11	729
Steck, Sarah B	Bethel	1	Sept. 10	658
Stratfield Nurseries (Geo. R. Godfrey, Prop.)	Bridgeport	35	Oct. 17	733
Stratford Rose Nurseries (John Barrows, Prop.)	Stratford	1	Aug. 31	631
Szirbik & Co., George	New Haven	1	Sept. 18	672
Tanner, E. G	Manchester	1	Aug. 6	573
Thomas Nursery	Hamden	2	Dec. 22	767
Tryon, George W	North Stonington	1	Aug. 21	599
Van Der Bom Nursery	Bethel	1	Aug. 30	628
Vanderbrook & Son, Charles L	Manchester	21	Aug. 20	592
Vanderstam, C. L	Yalesville	2	July 26	551
Van Wilgen Nurseries	Branford	8	Nov. 23	746
Vasileff, Nicholas	Greenwich	2	Sept. 22	682
Verkades' Nurseries	New London	37	Aug. 20	593
Vernik, John	Fairfield	2	Nov. 26	747
Wallace, A. T	Wallingford	7	Sept. 27	699
Wayside Farm Gardens (Miss I. E. Aldrich, Prop.)	Thomaston	2	Aug. 28	616
Wegner, C. F	Noroton Heights	3	Nov. 28	758
Weirether, Leo (2)	West Haven	1	Sept. 22	685
Wheeler, C. B	North Stonington	1	Aug. 21	595
Wild, Henry	Greenwich and Norwalk	30	Sept. 27	694
Williams, Carl C	Southport	1	Oct. 15	731
Williams, Harry G	Shelton	1	Sept. 19	676
Wilcox, Elmer E	Guilford	1	Aug. 21	594
Wilson & Co., C. E	Manchester	110	Aug. 16	583
Woodruff, Carleton V	Orange	1	Oct. 2	712

Name of Firm	Address	Acreage	Certificates Issued	No. of Certificate
Wyllie, David	Whitneyville	1	Sept. 5	641
Yale Landscape Department	New Haven	2	Oct. 26	737
Yale School of Forestry	New Haven	2	Sept. 19	679
Zack Co., H. J	Deep River	12	Sept. 27	701
Total acres		3,194		

Inspection of Raspberry Plantations

Each year for several years, certain nurserymen and raspberry growers have applied for special inspections and certificates in order to permit them to sell plants, free from the so-called mosaic diseases. Without these special certificates they are unable to ship raspberry plants into the five states of Michigan, Minnesota, New York, Vermont and Wisconsin. In 1928, two nursery firms duly applied for the special inspection and certificates. The inspections were made at the proper time and the diseased plants removed. After the second inspection two certificates were granted. Certain varieties contained too much mosaic to be covered by the certificates, which include only the varieties indicated as follows:

Special Certificates on Raspberry Plants

Name of Firm	Address	Variety	Certificate Date of Issue	Certificate Number
Barnes Nursery & Orchard Co.	Wallingford	Latham	Oct. 18	18
Conine Nursery Co	Stratford	Cuthbert La France St. Regis White Queen	Oct. 17	17

Nursery Dealers

Chapter 265, Public Acts of 1925, provides that dealers in nursery stock must register each year, on or before March 1, with the State Entomologist, and cite the principal sources of their nursery stock. All dealers' permits are for the remainder of the calendar year and expire on December 31. During the year 104 such dealers have registered and received permits. The list of dealers is on file in the office of the State Entomologist but is not printed in this Report.

Out-of-State Nurserymen

Nurserymen in other states wishing to ship stock into Connecticut are required to file with the State Entomologist signed copies of their nursery inspection certificates and make application for

permits to ship stock into the State. These permits are valid only for the periods covered by the certificates placed on file. During the year 261 permits have been issued to nurserymen in other states, but the list of firms receiving them is not printed in this Report.

Parcel Certificates

In addition to the regular inspection and certification of nursery stock, occasionally individuals wish to send shrubs and plants to their friends, and sometimes nurserymen need to ship packages before receiving their regular certificates. Consequently 237 separate parcels of nursery stock have been inspected and package certificates furnished.

Inspection of Narcissus Bulbs

On account of Federal quarantine No. 62, narcissus bulbs grown in Connecticut cannot be shipped into other states unless given two inspections, one in the field in May, and the other after the bulbs have been dug for shipment. In case they are found to be infested with bulb flies or eelworms, they must then be treated. During the year 45,500 such bulbs were inspected and certified.

Inspecton of Laurel and Decorative Materials

Considerable decorative material is gathered each year in Connecticut woodlands and shipped into New York City. This is mostly mountain laurel, *Kalmia latifolia.* If gathered within the gipsy moth quarantined area, it is examined by Federal inspectors, and if found clean, is certified for shipment. Much of it is collected outside the quarantined area and yet cannot enter New York without being certified. During the year 151 such certificates were issued.

Inspection of Shelled Seed Corn

On account of the European corn borer having been found in a small portion of Connecticut, certain states would not allow shelled sweet corn for seed to enter unless it had been inspected and certified to be free from bits of cob large enough to carry borers. Therefore a large quantity of such seed corn was inspected as it came through the cleaning mill, and 475 certificate tags were issued.

INSPECTION OF IMPORTED NURSERY STOCK

W. E. Britton and M. P. Zappe

Beginning with the year 1920, only rose and fruit tree seedlings have been allowed to enter Connecticut from foreign countries. All other nursery stock is prohibited, except new varieties for propagation which must enter through Washington, D. C., where the material is inspected and if infested, treated and held under quarantine or destroyed. Even the rose and fruit seedlings enter the country under regulations prescribed by the Federal Horticultural Board, now called the Plant Quarantine and Control Administration. The system requires applications, permits, proper marking, releases at ports of entry, inspection at points of destination and reports of the inspection sent to Washington. The ispection is usually made by the State officers. The imported nursery stock entering Connecticut in 1928 has been inspected by Mr. Zappe with the assistance at rush periods of Messrs. B. H. Walden, B. W. McFarland and R. C. Botsford. In number of shipments, number of cases and number of plants, the importations of 1928 were somewhat less than those of the preceding four years, as the following table shows:

Year	No. of shipments	No. of cases	No. of plants
1920	17	87	814,491
1921	21	126	1,228,560
1922	30	159	1,997,595
1923	35	179	1,981,895
1924	33	313	3,489,170
1925	27	277	2,977,346
1926	32	347	3,443,357
1927	31	321	3,229,915
1928	36	277	2,680,700

Sources of Imported Nursery Stock, 1927-1928

As in preceding years the greatest number of shipments came from Holland, but from France came the greatest number of cases and plants. The record for the year is as follows:

Country	No. of shipments	No. of cases	No. of plants
Holland	13	132	1,019,500
France	10	142	1,643,200
England	3	3	18,000
Total	26	277	2,680,700

These 26 shipments were imported by nine different firms of Connecticut nurserymen and florists, 15 shipments being con-

signed to two firms. Nine shipments were composed of fruit stock and 17 shipments of rose stock.

Kinds of Stock Imported

Of this plant material inspected, 1,273,500, or about 48 per cent were rose plants, and 1,407,200, or nearly 52 per cent were fruit tree seedlings. The number of each kind is shown in the following table:

FRUIT STOCKS

Variety	No. of plants	Total
Apple (all kinds)	486,000	
Cherry (all kinds)	671,700	
Pear	134,500	
Plum	105,000	
Quince	10,000	1,407,200

ROSE STOCKS

Variety	No. of plants	Total
Manetti rose	1,109,500	
Multiflora rose	42,000	
Rugosa rose	122,000	1,273,500
Grand total fruit stocks and rose stocks		2,680,700

The following table shows the quantities of stock inspected by months:

Month	No. of shipments	No. of cases	No. of plants
December	6	28	253,000
January	9	145	1,626,200
February	6	27	262,000
March	3	34	315,500
April	2	43	224,000
Total	26	277	2,680,700

The time required to inspect this imported plant material is equivalent to one man working 27 days and his time, traveling and other necessary expenses amounts to about $400.00.

In addition to the inspected material enumerated and tabulated above, there were 37 shipments of tree seeds which were not inspected in Connecticut, but which were fumigated at the port of entry. Of all shipments of imported stock 26 reports were made to the Federal Horticultural Board at Washington. There were also 11 shipments of new varieties for propagation, which were inspected at Washington, D. C.

Of the 26 shipments inspected, 15 shipments or about 58 per cent were found infested with insects, some of which are well-known pests. Detailed information regarding them follows:

PESTS FOUND ON IMPORTED NURSERY STOCK

15 Shipments Infested

Acronycta auricoma Schiff. (2 shipments). On quince, pear and plum, A. Fermaud, Angers, France; on apple and cherry, Andre Choplin, Maze, France.

Aporia crataegi Linn. (1 shipment). On apple, 5 nests, A. Fermaud, Angers, France.

Blaps mucronata Latr. (1 shipment). On cherry, A. Fermaud, Angers, France.

Emphytus cinctus Linn. (9 shipments). On manetti rose, Association Flora, C. Klyn & Co., Otto & Sons, Boskoop, H. H. Woldering, Veendam, Holland; Andre Choplin, Maze, France; Geo. I. Adamds, Tunbridge Wells, W. C. Slocock, Surrey, England.

Lampyrid eggs (1 shipment). In gallery of *Emphytus cinctus* in manetti rose, Geo. I. Adamds, Tunbridge Wells, England.

Lepidopterous pupae (2 shipments). Dead crushed specimens on cherry, Andre Choplin, Maze, France; Hemeray-Aubert, Orleans, France.

Mamestra dissimilis Kn. (1 shipment). Cocoon on rose, Andre Choplin, Maze, France.

Notolophus antiqua Linn. (5 shipments). One egg-mass on apple, 1 on rose, Andre Choplin, Maze, France; 3 egg-masses on apple, A. Fermaud, Angers, France; 1 egg-mass on apple, V. Lebreton, La Pyramide, France.

Papilio podalirius Linn. (1 shipment). On cherry, Andre Choplin, Maze, France.

Paratetranychus pilosus C. and F. (1 shipment). On apple, V. Lebreton, La Pyramide, France.

Woolly aphid (3 shipments). On apple, A. Fermaud, Angers, France, V. Lebreton, La Pyramide, France.

INSPECTION OF APIARIES IN 1928

In 1928, as in preceding years, the apiaries, of Connecticut have been inspected by Messrs. H. W. Coley, of Westport, and A. W. Yates, of Hartford, who have worked on a *per diem* basis. Mr. Coley has covered the southern half of the State, (Fairfield, New Haven, Middlesex and New London Counties), and Mr. Yates the northern half (Litchfield, Hartford, Tolland, and Windham Counties).

This inspection work in 1928 required 138 man days and together with traveling expenses cost $1,805.05. In all, 852 apiaries, containing 8,023 colonies, were inspected in 1928 as against 803 apiaries containing 8,133 colonies in 1927. The apiaries averaged 9.41 colonies each in 1928 and 10.1 each in 1927.

The following table shows the number of apiaries and colonies inspected and the average number of colonies per apiary, as well as the cost per apiary and colony for each year since the inspection work originated in 1910:

NINETEEN YEAR RECORD OF APIARY INSPECTION IN CONNECTICUT

Year	No. of Apiaries	No. of Colonies	Average No. Colonies Per Apiary	Average Cost of Inspection Per Apiary	Per Colony
1910	208	1,595	7.6	$2.40	.28
1911	162	1,571	9.7	1.99	.21
1912	153	1,431	9.3	1.96	.21
1913	189	1,500	7.9	1.63	.21
1914	463	3,882	8.38	1.62	.19
1915	494	4,241	8.58	1.51	.175
1916	467	3,898	8.34	1.61	.19
1917	473	4,506	9.52	1.58	.166
1918	395	3,047	7.8	1.97	.25
1919	723	6,070	11.2	2.45	.29
1920	762	4,797	6.5	2.565	.41
1921	751	6,972	9.2	2.638	.24
1922	797	8,007	10.04	2.60	.257
1923	725	6,802	9.38	2.55	.27
1924	953	8,929	9.4	2.42	.25
1925	766	8,257	10.7	2.45	.22
1926	814	7,923	9.7	2.35	.24
1927	803	8,133	10.1	2.37	.234
1928	852	8,023	9.41	2.12	.225

In 1928, apiaries were inspected in 149 towns as against 135 towns in 1927, and 137 towns in 1926.

Inspections were made in the following towns in 1928 which were not visited in 1927: Fairfield County—New Fairfield, Sherman; New Haven County—Bethany, Branford, Cheshire, East Haven, Hamden, Meriden, Middlebury, New Haven, North Branford, Orange, Southbury, Wolcott, Woodbridge; Middlesex County—Killingworth, Saybrook; New London County—East Lyme, Old Lyme, Preston, Sprague; Litchfield County—Cornwall, Goshen; Hartford County—Enfield, Southington, South Windsor; Windham County—Pomfret, Sterling.

On the other hand, the following 15 towns, where inspections were made in 1927, were not visited by the inspectors in 1928: Fairfield County—Trumbull, Weston, Shelton, Monroe; New Haven County—Ansonia, Beacon Falls, Prospect; New London County—Lisbon; Litchfield County—Barkhamsted; Tolland County—Willington; Windham County—Ashford, Chaplin, Eastford, Hampton, Thompson.

There are several towns where no recent inspections have been made. In Warren (Litchfield County) no apiaries have been inspected since 1919, though the inspector has made inquiries and failed to learn of any beekeepers in the town. Bridgeport (Fairfield County) has not been inspected since 1926. No inspection has been made in Eastford (Windham County) since 1924.

European Foul Brood

This is a disease of the young larvae, caused by a bacterial germ known as *Bacillus pluton,* and commonly called European foul

brood. Usually it is more troublesome in early summer than at other times during the year, the cell contents are not ropy or gelatinous, and though often with the odor of fermentation, it is not very offensive. Requeening with Italian queens and uniting two or more weak colonies to make them strong are common methods of control.

Of the 852 apiaries and 8,023 colonies inspected in 1928, 9 apiaries and 26 colonies were found infested with European foul brood. This infestation amounts to 1.05 per cent of the apiaries and .324 per cent of the whole number of colonies inspected during the season.

The following table gives a complete record of percentages of infestation of European foul brood in Connecticut since the inspection work began in 1910:

RECORD OF EUROPEAN FOUL BROOD

Year	Percentage of Infestation		Year	Percentage of Infestation	
	Apiaries	Colonies		Apiaries	Colonies
1910	75.9	49.7	1919	6.6	1.2
1911	51.8	27.4	1920	4.3	1.5
1912	47.7	23.5	1921	3.91	1.26
1913	44.4	24.5	1922	4.14	.85
1914	32.6	13.9	1923	2.34	.36
1915	26.1	10.3	1924	1.78	.526
1916	18.8	7.05	1925	2.48	.507
1917	16.7	4.86	1926	3.19	.858
1918	9.8	3.3	1927	1.12	.282
			1928	1.05	.324

During 1928, European foul brood was discovered only in the following 7 towns: Old Saybrook in Middlesex County; Bristol, Marlborough, New Britain, Newington, and Wethersfield in Hartford County; Brooklyn in Windham County. No apiaries infested with this disease were found in Fairfield, New Haven, New London, Litchfield or Tolland Counties.

American Foul Brood

American foul brood is also a disease of the larvae caused by the bacterial organism known to science as *Bacillus larvae,* but it attacks the brood at a later stage of development than does the European foul brood. It usually shows when the larvae are nearly mature or pupating after the cells are sealed. The diseased cells are shrunken, and if broken open, the contents have a peculiar ropy or stringy consistency and give off a very offensive odor. Formerly the treatment was to shake the bees into clean hives, destroy the infected combs, and disinfect the old hives. Now the diseased combs may be sterilized by soaking them in an alcohol-formalin solution containing twenty per cent of formalin, after which they may be used with safety.

Of the 852 apiaries and 8,023 colonies inspected in 1928, 36 apiaries and 79 colonies were infested with American foul brood. This infestation is equivalent to 4.213 per cent of the apiaries and .98 per cent of the colonies inspected in 1928. This record for 1928 is a greater percentage of infested apiaries than is usually found. It is the highest percentage of apiaries ever found and in only one year (1919) has the percentage of colonies infested with this disease been greater in Connecticut since the inspection work started in Connecticut.

The following table shows a complete record regarding American foul brood since apiary inspection was started in Connecticut in 1910.

RECORD OF AMERICAN FOUL BROOD

Year	Percentage of Infestation Apiaries	Colonies	Year	Percentage of Infestation Apiaries	Colonies
1910	0	0	1919	3	1.1
1911	0	0	1920	1.18	.25
1912	0	0	1921	2.5	.56
1913	0	0	1922	1.38	.27
1914	1.07	.7	1923	.985	.323
1915	.8	.18	1924	1.04	.22
1916	1.07	.15	1925	3.26	.424
1917	.42	.17	1926	1.72	.29
1918	1.01	.32	1927	3.11	.70
			1928	4.213	.98

During 1928, American foul brood was found in the following 22 towns: Ridgefield and Wilton in Fairfield County; Branford, Cheshire, Hamden, Prospect, and Wallingford in New Haven County; Chester and Middlefield in Middlesex County; East Lyme in New London County; Bethlehem, Thomaston, Watertown and Winchester in Litchfield County; Bristol, Hartland, Manchester, West Hartford and Windsor in Hartford County; Andover and Ellington in Tolland County, and Brooklyn in Windham County.

Sacbrood

Sacbrood or pickled brood is a disease often mistaken for American or European foul brood. The cause is considered to be a filterable virus. The larvae die about the time the cells are capped and lie on their backs with heads turned upward. The body is swollen and contents watery, but there is no ropiness, and the entire cell contents may easily be removed intact as if enclosed in a sac. The color is variable, though often light yellow or brown, with head nearly black. The usual treatment is to make strong colonies by uniting the weak ones. In certain rare cases where whole apiaries become infected, new queens should be supplied to all the colonies.

The following table shows the record of sacbrood since apiary inspection in Connecticut started in 1910:

RECORD OF SACBROOD

Year	Percentage of Infestation Apiaries	Colonies	Year	Percentage of Infestation Apiaries	Colonies
1910	0	0	1919	1.24	.19
1911	..	.51	1920	1.18	.229
1912	..	Several	1921	1.06	.157
1913	..	2.8	1922	1.37	.187
1914	2.59	.721	1923	.53	.086
1915	2.02	.47	1924	1.78	.52
1916	.428	.051	1925	3.39	.836
1917	1.48	.199	1926	1.1	.138
1918	.253	.032	1927	.03	.0036
			1928	.035	.087

During the year Sacbrood was found in the following 2 towns: Wallingford in New Haven County and Killingworth in Middlesex County.

Statistics of Inspection

The statistics of apiary inspection by towns and counties are given in the following pages with summary on page 711.

INSPECTION OF APIARIES, 1928

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Sacbrood
Fairfield County:							
Bethel	6	0	44	0	0	0	0
Bridgeport	0	0	0	0	0	0	0
Brookfield	3	0	62	0	0	0	0
Danbury	1	0	16	0	0	0	0
Darien	1	0	28	0	0	0	0
Easton	1	0	70	0	0	0	0
Fairfield	3	0	46	0	0	0	0
Greenwich	6	0	34	0	0	0	0
Monroe	0	0	0	0	0	0	0
New Canaan	2	0	28	0	0	0	0
New Fairfield	3	0	27	0	0	0	0
Newtown	0	0	0	0	0	0	0
Norwalk	1	0	16	0	0	0	0
Redding	2	0	40	0	0	0	0
Ridgefield	5	4	32	14	14	0	0
Shelton	0	0	0	0	0	0	0
Sherman	1	0	5	0	0	0	0
Stamford	4	0	57	0	0	0	0
Stratford	1	0	28	0	0	0	0
Trumbull	0	0	0	0	0	0	0
Weston	0	0	0	0	0	0	0
Westport	2	0	32	0	0	0	0
Wilton	12	3	147	11	11	0	0
	54	7	712	25	25	0	0

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Sacbrood
New Haven County:							
Ansonia	0	0	0	0	0	0	0
Beacon Falls	0	0	0	0	0	0	0
Bethany	5	0	14	0	0	0	0
Branford	2	1	14	2	2	0	0
Cheshire	6	1	108	3	3	0	0
Derby	1	0	5	0	0	0	0
East Haven	2	0	15	0	0	0	0
Guilford	8	0	44	0	0	0	0
Hamden	7	0	73	0	0	0	0
Madison	3	2	14	2	2	0	0
Meriden	4	0	56	0	0	0	0
Middlebury	4	0	30	0	0	0	0
Milford	2	0	33	0	0	0	0
Naugatuck	5	0	60	0	0	0	0
New Haven	2	0	10	0	0	0	0
North Branford	1	0	12	0	0	0	0
North Haven	1	0	26	0	0	0	0
Orange	4	0	25	0	0	0	0
Oxford	0	0	0	0	0	0	0
Prospect	4	1	34	1	1	0	0
Seymour	1	0	27	0	0	0	0
Southbury	1	0	14	0	0	0	0
Wallingford	13	3	83	9	4	0	5
Waterbury	5	0	26	0	0	0	0
West Haven	0	0	0	0	0	0	0
Wolcott	2	0	12	0	0	0	0
Woodbridge	2	0	28	0	0	0	0
	85	8	763	17	12	0	5
Middlesex County:							
Chester	8	0	50	0	0	0	0
Clinton	5	1	59	2	2	0	0
Cromwell	4	0	55	0	0	0	0
Durham	0	0	0	0	0	0	0
East Haddam	4	0	154	0	0	0	0
East Hampton	9	0	115	0	0	0	0
Essex	4	0	37	0	0	0	0
Haddam	5	0	63	0	0	0	0
Killingworth	7	1	17	2	0	0	2
Middlefield	2	1	36	8	8	0	0
Middletown	4	0	56	0	0	0	0
Old Saybrook	5	0	74	14	0	14	0
Portland	6	0	44	0	0	0	0
Saybrook	1	0	16	0	0	0	0
Westbrook	1	0	8	0	0	0	0
	65	4	784	26	10	14	2
New London County:							
Bozrah	1	0	9	0	0	0	0
Colchester	12	0	143	0	0	0	0
East Lyme	2	1	98	1	1	0	0
Franklin	2	0	89	0	0	0	0
Griswold	1	0	72	0	0	0	0
Groton	6	0	82	0	0	0	0
Lebanon	11	0	132	0	0	0	0

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Sacbrood
New London County—*cont.*							
Ledyard	5	0	61	0	0	0	0
Lisbon	0	0	0	0	0	0	0
Lyme	2	0	86	0	0	0	0
Montville	7	0	64	0	0	0	0
New London	3	0	15	0	0	0	0
North Stonington	1	0	15	0	0	0	0
Norwich	14	0	459	0	0	0	0
Old Lyme	1	0	14	0	0	0	0
Preston	4	0	95	0	0	0	0
Salem	1	0	9	0	0	0	0
Sprague	2	0	62	0	0	0	0
Stonington	5	0	68	0	0	0	0
Voluntown	2	0	12	0	0	0	0
Waterford	2	0	34	0	0	0	0
	84	1	1,619	1	1	0	0
Litchfield County:							
Barkhamsted	0	0	0	0	0	0	0
Bethlehem*	11	2	43	3	3	0	0
Bridgewater	5	0	87	0	0	0	0
Canaan	3	0	15	0	0	0	0
Colebrook	2	0	27	0	0	0	0
Cornwall	4	0	20	0	0	0	0
Goshen	4	0	35	0	0	0	0
Harwinton	7	0	17	0	0	0	0
Kent	5	0	99	0	0	0	0
Litchfield	9	0	122	0	0	0	0
Morris	5	0	27	0	0	0	0
New Hartford	9	0	29	0	0	0	0
New Milford	6	0	111	0	0	0	0
Norfolk	3	0	16	0	0	0	0
North Canaan	2	0	63	0	0	0	0
Plymouth	8	0	34	0	0	0	0
Roxbury	5	0	38	0	0	0	0
Salisbury	7	0	80	0	0	0	0
Sharon	5	0	71	0	0	0	0
Thomaston	8	2	32	3	3	0	0
Torrington	12	0	89	0	0	0	0
Warren	0	0	0	0	0	0	0
Washington	8	0	140	0	0	0	0
Watertown	11	1	53	3	3	0	0
Winchester	14	1	68	1	1	0	0
Woodbury	5	0	86	0	0	0	0
	158	6	1,402	10	10	0	0
Hartford County:							
Avon	5	0	19	0	0	0	0
Berlin	12	0	227	0	0	0	0
Bloomfield	10	0	159	0	0	0	0
Bristol*	17	2	93	3	2	1	0
Burlington	4	0	26	0	0	0	0
Canton	10	0	48	0	0	0	0
East Granby	3	0	20	0	0	0	0

*One colony inspected twice.

Town	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Sacbrood
Hartford County—*cont.*							
East Hartford	8	0	38	0	0	0	0
East Windsor	15	0	83	0	0	0	0
Enfield	9	0	51	0	0	0	0
Farmington	12	0	75	0	0	0	0
Glastonbury	8	0	91	0	0	0	0
Granby	9	0	65	0	0	0	0
Hartford	2	0	22	0	0	0	0
Hartland	2	2	98	3	3	0	0
Manchester	11	2	63	2	2	0	0
Marlborough	2	1	29	2	0	2	0
New Britain	9	2	79	2	0	2	0
Newington†	9	1	65	4	0	4	0
Plainville	14	0	46	0	0	0	0
Rocky Hill	4	0	32	0	0	0	0
Simsbury	10	0	51	0	0	0	0
Southington	7	0	35	0	0	0	0
South Windsor	7	0	40	0	0	0	0
Suffield	12	0	76	0	0	0	0
West Hartford	15	3	96	5	5	0	0
Wethersfield	15	2	71	2	0	2	0
Windsor*	18	1	94	1	1	0	0
Windsor Locks	2	0	8	0	0	0	0
	261	16	1,900	24	13	11	0
Tolland County:							
Andover	6	1	17	7	7	0	0
Bolton	4	0	17	0	0	0	0
Columbia	7	0	27	0	0	0	0
Coventry	13	0	74	0	0	0	0
Ellington	9	1	41	1	1	0	0
Hebron	6	0	25	0	0	0	0
Mansfield	8	0	34	0	0	0	0
Somers	2	0	9	0	0	0	0
Stafford	13	0	40	0	0	0	0
Tolland	8	0	42	0	0	0	0
Union	3	0	2	0	0	0	0
Vernon	3	0	19	0	0	0	0
Willington	0	0	0	0	0	0	0
	82	2	347	8	8	0	0
Windham County:							
Ashford	0	0	0	0	0	0	0
Brooklyn	3	1	109	1	0	1	0
Canterbury	4	0	56	0	0	0	0
Chaplin	0	0	0	0	0	0	0
Eastford	0	0	0	0	0	0	0
Hampton	0	0	0	0	0	0	0
Killingly	6	0	40	0	0	0	0
Plainfield	12	0	47	0	0	0	0
Pomfret	5	0	29	0	0	0	0
Putnam	5	0	36	0	0	0	0
Scotland	7	0	33	0	0	0	0
Sterling	3	0	16	0	0	0	0
Thompson	0	0	0	0	0	0	0
Windham	12	0	70	0	0	0	0
Woodstock	6	0	60	0	0	0	0
	63	1	496	1	0	1	0

*One apiary inspected twice.
†One bee paralysis.

SUMMARY

County	No. Towns	Apiaries Inspected	Apiaries Diseased	Colonies Inspected	Colonies Diseased	Foul Brood American	Foul Brood European	Sacbrood
Fairfield	17	54	7	712	25	25	0	0
New Haven	23	85	8	763	17	12	0	5
Middlesex	14	65	4	784	26	10	14	2
New London	20	84	1	1,619	1	1	0	0
Litchfield	24	158	6	1,402	10	10	0	0
Hartford	29	261	17*	1,900	25*	13	11	0
Tolland	12	82	2	347	8	8	0	0
Windham	10	63	1	496	1	0	1	0
	149	852	46	8,023	113	79	26	7

	No. Apiaries	No. Colonies
Inspected	852	8,023
Infested with European foul brood	9	26
Per cent infested	1.05	.324
Infested with American foul brood	36	79
Per cent infested	4.213	.98
Infested with Sacbrood	3	7
Infested with bee paralysis	1	1
Average number of colonies per apiary		9.41
Cost of inspection		$1,805.05
Average cost per apiary		$2.12
Average cost per colony		.225

Registration of Bees

Though Chapter 129, Public Acts of 1923, provides that all beekeepers shall register with the town clerk of the town in which the bees are kept, on or before October 1 of each year, the law is not enforced and only a portion of the apiaries are registered. In Stafford in 1924, one beekeeper was prosecuted and fined for failing to register, but I have not learned of any other case in Connecticut where the law has been enforced. In one town in 1928, the town clerk (a woman) telephoned to certain persons known to keep bees, with the result that all of them registered.

The law also provides that the town clerks shall report all such registrations to the State Entomologist on or before February 1, but does not require them to report in case no registrations have been made. Consequently, without investigating the matter, it is impossible to know whether the town clerk has failed to report the names registered or whether no bees have been registered in the town. Probably the General Assembly of 1929 will be asked to change this provision of the law.

The law as it now stands is as follows:

"Section 1. Every person owning one or more hives of bees shall, annually, on or before the first day of October, make application to the town clerk of the town in which such bees are kept, for the registration of such bees, and such town clerk shall issue to such applicant a certificate

*One colony had bee paralysis.

of registration upon the payment of a recording fee of twenty-five cents, which certificate shall be in the form prescribed and upon blanks furnished by the commissioner of domestic animals and shall be recorded in the office of such town clerk.

Sec. 2. A record of such registration and of the name and place of residence of the registrant and the definite location in the town where bees are kept by him shall be kept in a separate book in the office of the town clerk, which record shall be accessible to the public. Each town clerk shall file with the state entomologist of the Connecticut Agricultural Experiment Station a complete list of such registrations and locations on or before the first day of February of the year succeeding such registrations. Any town clerk failing to perform such duty shall be fined not more than ten dollars.

Sec. 3. Any owner of bees who shall fail to register as required by the provisions of this act shall be fined not more than five dollars."

All beekeepers should each year on or before October 1, register with the town clerk in the towns where the bees are kept.

All town clerks after October 1, should report complete data regarding such registration to the State Entomologist.

GIPSY MOTH WORK IN CONNECTICUT IN 1928

By W. E. Britton and John T. Ashworth

The work of suppressing the gipsy moth has been continued on the same plan as adopted in former years, by the State of Connecticut in cooperation with the Federal Bureau of Entomology. As the Federal forces have ever been chiefly interested in preventing the further spread of the insect, they have operated in the territory along the western border of the infested area. The State forces for the most part have worked in the territory further eastward which is known to be infested. We are greatly indebted to Messrs. A. F. Burgess and H. L. Blaisdell, in charge of the Federal work, for their hearty cooperation and we here express to them our thanks and appreciation.

Financial Statement

RECEIPTS

Appropriation for biennial period ending June 30, 1929	$100,000.00
Rebate on automobile insurance	199.04
Total	$100,199.04

EXPENDITURES

Salaries		$4,840.00
Labor		39,174.67
Stationery and office supplies		32.00
Sundry supplies		13.94
Communication service		
Telephone	$64.80	
Postage	11.24	
		76.04

Travel expenses		$270.36	
Gasoline		1,571.22	
Oil		730.72	
Transportation of things		60.86	
Printing (warning signs)		27.50	
Heat, Light, Water and Power:			
Fuel	$144.10		
Electricity	20.00		
		164.10	
Tools, machinery and appliances		663.75	
Spray materials		1,111.77	
Buildings and land			
Office rent	$ 12.00		
Rent of storehouse	300.00		
Storage of autos	328.50		
		640.50	
Contingent expenses			
Purchase of new Buick car	$1,262.00		
Medical services	2.00		
Insurance (liability):			
on autos	625.54		
fire and theft	81.39		
stock and fixtures	131.50		
Spray damage to auto	25.00		
		2,127.43	
Automobile repairs and supplies		1,538.53	
			$53,043.39
Balance			$47,155.65

Equipment

The Buick touring car used for the past three years, having reached the point of requiring frequent repairs, was exchanged for a new Buick sedan early in July, 1927. A Dodge touring car has nearly outlived its usefulness, and authorization has already been granted to exchange it for a Chevrolet sedan. Nine Ford light delivery trucks are used in transporting the scouts from their boarding places to the field, each crew having a truck in charge of the foreman. Two Netco trucks with Fitzhenry-Guptill pumps and 400-gallon tanks are used in spraying, and a horse-drawn power sprayer is available if needed.

During the year, 1,000 feet of new spray hose was purchased. This gives us about 3,500 feet of one-inch high pressure spray hose and 150 feet of suction hose.

The storehouse rented on North Main Street, Danielson, is provided with gasoline tank and pump, and is well equipped with small tools, Ford parts, tires and tubes, so that most of the repair work can be done by our own men.

Details of Work by Counties and Towns

The following pages contain a detailed account of the scouting, spraying and other control measures in the infested towns.

When egg-clusters are found, they are always saturated with creosote to kill the eggs. Complete statistics are given in the tables beginning on page 723 and are summarized on page 725.

WINDHAM COUNTY

The only scouting in Windham County this year was done in training men, with a little additional work in late spring, and was all confined to the three following towns:

Killingly—54 Infestations—2,437 Egg-clusters

Killingly was used as a training school this year, and the southern two-thirds of the town was scouted. The infestations found were not so large as in preceding years, but were closer together, indicating a more general infestation especially at the eastern end of the town near the Rhode Island State line. The largest colony found was in white oak woodland owned by G. E. Paine, situated on the Green Hollow road just south of Danielson; 598 egg-clusters were found and treated here. On the south side of the Providence pike just east of the village of South Killingly, 345 egg-clusters were found on six trees and in a stone wall. These were the only large colonies found in the town and spraying was done by State men in June.

Scotland—2 Infestations—6 Egg-clusters

Scouting in this town was started May 5, and two small infestations of three egg-clusters each were found, one in the southwestern corner of the town and the other about one mile north of the post office.

Sterling—8 Infestations—405 Egg-clusters

It was late in May before scouting was started in Sterling, and the eggs were hatching when the men found them. Before the town was completed, scouting had to be stopped, and spraying was started. Two large colonies were found just north of the Providence road near the Rhode Island line, one of 146 egg-clusters was on land owned by J. H. Brown and the other of 100 egg-clusters was a short distance southward on land owned by Henry Esklinen. Three places were sprayed by State men in June.

NEW LONDON COUNTY

New London—15 Infestations—660 Egg-clusters

Two large colonies were found in New London by a State crew this year, one of 230 egg-clusters on a white oak and in a stone

wall on Roosevelt Street, on land owned by Mr. McMahon, and the other of 211 egg-clusters on Glenwood Avenue, in the southern end of the town. These two infestations were the only large ones and the other colonies were distributed rather evenly throughout the town. Spraying was done by State men.

North Stonington

Before scouting could be started in North Stonington, the egg masses were hatching and the men had to start spraying; however, after the spraying was over men were sent to scout around locations where the pest had been found in former years. Altogether 342 pupae and larvae were found and destroyed.

Norwich—8 Infestations—1,007 Egg-clusters

Seven of the eight infestations found this year in Norwich were situated in the Greenville district, and two of them were large colonies. One of 760 egg-clusters was found to extend over several blocks west of North Main Street, and the other of 145 egg-clusters was on land owned by C. E. Jennings at 201 Hamilton Avenue. A large amount of spraying was done in Norwich by State men.

Old Lyme

In the season of 1922 three small infestations were discovered and treated in Old Lyme. As the territory around these places had since been scouted several times and nothing found, the work this year consisted of summer scouting around the old infestations; no larvae or pupae were found.

Stonington—39 Infestations—5,791 Egg-clusters

Fifty-seven egg-clusters were found this year in the village of Stonington where in the same territory 1,159 were found last year. This year 4,958 egg-clusters were found in the village of Pawcatuck where conditions were worse than in Stonington village last year. The trees of the entire village were sprayed, and it is hoped that the results will be as successful as in Stonington village last year. A large colony was found in woodland owned by H. C. Davis located on the east side of Quiambog Cove but the other infestations were small, most of them containing less than ten egg-clusters. Spraying was done by State men.

Bozrah—1 Infestation—970 Egg-clusters

One large colony was found in Bozrah on the west side of Bear Hill on two white oaks and in a stone wall on land owned by E. A.

Bishop about one-eighth of a mile back from the road. A majority of the 970 egg-clusters were in the stone wall. This infestation was sprayed by State men.

East Lyme

The work in East Lyme this year consisted of scouting for larvae around the places where the gipsy moth had occurred before; 16 pupae were found and destroyed by State men.

The towns of Franklin and Ledyard were also scouted but nothing found.

Groton—9 Infestations—76 Egg-clusters

None of the infestations found in Groton this year were large; two of 20 egg-clusters each were located in the southwestern end of the town, one on apple trees in Schnescotte Park, the other on maple, cherry and apple trees and in a stone wall at Branford Farms. The spraying was done by State men.

Lebanon—14 Infestations—3,216 Egg-clusters

All but one of the infestations in this town were situated in the northern half; in fact, ten of the fourteen were in the extreme northern end, and it looks as if the entire spread had come from a woodland colony on land owned by Mr. Lieberman between Sweet Hill and Lebanon Village. Altogether 2,209 egg-clusters were found in this colony. A colony of 317 egg-clusters was found in the margin of a woodland owned by Mr. Blakesly just east of Lebanon Street, and the next largest colony was one of 211 egg-clusters found in woodland owned by the Boston Club. These three infestations contained more than 80 per cent of the total number of egg-clusters found in the town. State men sprayed around these infestations.

MIDDLESEX COUNTY

East Haddam

East Haddam was the only town scouted in Middlesex County this year and no trace of gipsy moth was found.

TOLLAND COUNTY

Columbia—11 Infestations—3,106 Egg-clusters

The infestations in Columbia were all situated in the southwestern part of the town and all but two of them occurred in wooded areas. The largest infestation contained 1,815 egg-clusters scat-

ered throughout a large block situated on both sides of the State road leading from Hebron to Columbia, near the Hebron town line. A colony of 514 egg-clusters was found just east of the one mentioned, in woodland and orchard owned by Mr. Bailey and Mr. Topple. These were the largest colonies although four others of 100 or more egg-clusters each were found in the town. Spraying was done by State men.

Coventry—6 Infestations—515 Egg-clusters

Two large colonies were found in Coventry this year by a State crew, one of 215 egg-clusters in woodland owned by B. Hyde, and situated about a mile south of Coventry village. The other was in an oak grove owned by E. A. White, just across the Willimantic River from Eagleville where 215 egg-clusters were found. The spraying was done by State men.

Ellington—25 Infestations—704 Egg-clusters

Most of the infested territory in Ellington lies in the northern part of the town between the State road leading to Somers and Crystal Lake, and most of the colonies were small. Two woodland colonies are mentioned here as they are stiuated on the high ridge extending south from Soapstone Mountain and are open to windspread, one containing 204 egg-clusters on land owned by Joe Witiuk, and the other of 101 egg-clusters on land owned by F. L. Worthington. State men did the spraying.

Hebron—8 Infestations—813 Egg-clusters

Six of the eight infestations found this year were located in the southwestern end of the town. Two of the largest were woodland colonies, one of 353 egg-clusters on land owned by Messrs. Adler and Staba, and the other of 242 egg-clusters on land owned by Mrs. Adela White. The spraying was done by State men.

Mansfield—34 Infestations—2,772 Egg-clusters

Mansfield was scouted this year for the first time since 1924, and the degree of infestation has greatly increased since that time. The infestations were found scattered over the whole town, the largest colonies occurring in the northeastern or Wormwood Hill section. Colonies of 536, 269, 255, and 241 egg-clusters were discovered in woodlands owned respectively by Messrs. Sulkowski, Feingold and Smith. Though these colonies were the largest found in the town, there were several of 100 or more egg-clusters each. The spraying in this town was done by State men.

Somers—19 Infestations—1,431 Egg-clusters

Two large colonies were found in Somers this year by a State crew, both situated nearly on the Massachusetts State line north of North Somers. One of 477 egg-clusters on apple, maple and pine trees also in a stone wall, the owner of which could not be found; the other was in apple, maple and oak trees on land owned by Anthony Joonelas. The rest of the infestations, although spread separately over the town, were all small. State men did the spraying.

Stafford—113 Infestations—4,353 Egg-clusters

Stafford is generally infested throughout the entire township; in fact, it is in about the same condition as Thompson, Woodstock and Union. Only two really large colonies were discovered, the others being of medium size. Both colonies mentioned above were located in the Stafford Springs district, one of 279 egg-clusters on land owned by Malone Moore and Fred Ruby, and the other of 258 egg-clusters was on the Cyril Johnson Woolen Company's property on High Street. Spraying was done by State men.

Tolland—3 Infestations—119 Egg-clusters

In Tolland, 110 of the 119 egg-clusters found this year were in white oaks just north of Tolland Village on land owned by E. Ewald; the other nine egg-clusters were in two colonies of five and four egg-clusters each found on land owned by J. D. Cohen, near the Ellington town line. The spraying was done by a State crew.

Vernon—2 Infestations—120 Egg-clusters

A colony of 117 egg-clusters was discovered by a State crew in Vernon this year about one mile north of Vernon Center, in pasture oaks owned by Mr. Dougherty. About the same distance east of the village, another of three egg-clusters was found in oak woodland. Both places were sprayed by a State crew.

Willington—34 Infestations—1,104 Egg-clusters

All but three of the infestations in Willington were in the northern half of the township; these were small and found from East Willington southward along the Ashford town line. There were two large colonies found in the northwestern part of the town, one on apple trees and in a woodland owned by P. Figura, containing 285 egg-clusters, and one of 264 egg-clusters on 14 trees around Mr. P. Halchek's house. The rest of the colonies were small and of one year's standing. State men did the spraying in this town.

HARTFORD COUNTY

East Windsor—1 Infestation—1 Egg-cluster

A single egg-cluster was found in a maple tree owned by Mrs. Cushman, situated about one and one-half miles west of Windsorville on the north side of Keach Brook, this being the only trace of the gipsy moth found by the State scouts in this town. No spraying was thought necessary.

Enfield—1 Infestation—6 Egg-clusters

A small colony of six egg-clusters was found in one white oak tree in a field owned by Mrs. Elizabeth Pierce, about two miles south of Hazardville. One egg-cluster was found at this place in 1922. This colony was sprayed July 2 by State men.

Granby—24 Infestations—1,580 Egg-clusters

This town was used by the Federal forces to train men before sending them into the outside territory. In addition to the roadside scouting, 280 acres of woodland were scouted, divided into eight separate blocks. The bulk of the infestations are still confined to the southwestern corner of the town where the largest colonies were found. There were two of them, one of 870 egg-clusters in the woodland owned by Max Shinder, and the other of 262 egg-clusters in woodland owned by Mr. Lapion. Just north of these colonies was found an infestation of 108 egg-clusters in an orchard owned by Andrew Boris. The spraying was done by State men and over three-quarters of a ton of dry arsenate of lead was used.

Hartford—4 Infestations—151 Egg-clusters

One colony of 124 egg-clusters was found on property owned by Professor Paton, at No. 50 Forest Street, and another of 18 egg-clusters on roadside trees at the corner of Farmington Avenue and South Marshall Street. Both of these infestations were sprayed on July 3 by State men.

Hartland—5 Infestations—583 Egg-clusters

The Federal forces used Hartland for training men the same as Granby. The two largest colonies were found on property owned by Mr. Lichdi, in the northeast corner of the town. One was in woodland and contained 209 egg-clusters, and the other was a colony of 144 egg-clusters in an orchard. Both these colonies and another small infestation of seven egg-clusters in Mr. Eddy's orchard were sprayed by State men.

Suffield—9 Infestations—259 Egg-clusters

Only one colony of considerable size was found this year in Suffield. This was in woodland owned by the Berkshire Ice Co., of Southwick, Mass., situated on the western side of the town near Lake Congamond. This and a small infestation in a pasture were sprayed on July 2 by State men.

Wethersfield—1 Infestation—715 Egg-clusters

A large colony of 715 egg-clusters was found this year in Wethersfield on meadow land owned by E. Isaacson, near the bend of the Connecticut River. When the crew scouted this territory a lot of the land was covered with water so the ground work could not be done. In June, the spraying machines were sent there in an attempt to spray the trees but on account of two days of rain, the land was flooded and the sprayers had to be removed. They were sent to other parts of the state to continue the work, but later they returned and had sprayed about four and one-half acres of woodland when similar conditions arose and the work had to be abandoned for this season.

In the following towns—Bloomfield, Bristol, Burlington, Canton, New Britain, Simsbury, South Windsor and West Hartford —work was confined to scouting the territory around last year's infestations, and no re-infestations were found in any of these towns. The towns of Rocky Hill, Windsor and Windsor Locks were completely scouted and no infestations found.

LITCHFIELD COUNTY

The only work done by State men in Litchfield County consisted in scouting around last year's infestations in the three towns of Harwinton, New Hartford and Plymouth. One egg-cluster was found near an old infestation in Harwinton, but nothing was discovered in the other two towns. All other work in Litchfield County reported in this paper was done by Federal men. Without their help it would have been impossible to have covered so much territory. More towns were scouted in this section of the State in 1927-1928 than has been covered in one season for several years.

Barkhamsted—4 Infestations—748 Egg-clusters

Of the total number of egg-clusters discovered in Barkhamsted this year, 722 were found in woodland owned by C. LeGeyt, situated on the eastern edge of the town near the Granby line. This colony seemed to have spread from the large colony on Mr. Shinder's property in the southwestern corner of Granby. The

three other infestations were all in woodland and all very small. Spraying was done at two of the colonies by State men.

Canaan

Federal men scouted 1,082 acres of woodland this year in Canaan; this was territory in and around old infestations and no trace of the gipsy moth was found.

Colebrook—1 Infestation—46 Egg-clusters

One colony of 46 egg-clusters was found on fruit and shade trees owned by Frank Williams, situated about two miles west of the Colebrook Post Office.

Cornwall—9 Infestations—280 Egg-clusters

All nine infestations found in Cornwall this year were situated in a cluster around and on South Mountain, which is in the southwestern part of the town near Cornwall Bridge. The two largest were woodland colonies on land owned by Dr. W. C. Clark and contained 83 and 61 egg-clusters respectively; two other colonies were found on Dr. Clark's property. One colony of 60 egg-clusters and three smaller ones were on property owned by Mr. Patterson. About 180 acres of woodland were sprayed at these infestations, nearly a half ton of lead arsenate being used.

Goshen—1 Infestation—1,626 Egg-clusters

A large colony of 1,626 egg-clusters was found in Goshen in woodland owned by the Waterbury Water Company, situated directly south of the West Goshen Post Office, near the Litchfield line. Twenty-five and one-half acres of woodland were sprayed by Federal men.

New Milford

The scouting in New Milford this year was confined to the territory around last year's infestation, in southern end of the town, where about 1,518 acres of woodland were scouted and nothing found.

Norfolk—7 Infestations—162 Egg-clusters

The infestations (as in the case of Cornwall) were all grouped in the northeastern corner of the town, all in woodland and the two largest were colonies of 52 and 49 egg-clusters, on land owned by Mr. Laitinen and the Doolittle Lake Company, respectively. A Federal crew sprayed five of the colonies, and over one and one-

quarter tons of dry arsenate of lead were used in spraying 101 acres of woodland. In one place nearly a mile of hose was necessary to reach the infested trees.

North Canaan—3 Infestations—68 Egg-clusters

Three small colonies were found about one mile east of East Canaan, in woodlands owned by James Rosier, Max Sivan and B. Stevens, where 32, 31 and five egg-clusters were found in the order named. The spraying was done by Federal men on June 11 and 12.

Salisbury—1 Infestation—16 Egg-clusters

One small colony of 16 egg-clusters was found in woodland owned by F. C. Hood, located west of Falls Village and just south of Mount Prospect. Eleven acres were sprayed between July 3 and July 7 by a Federal crew.

Sharon—2 Infestations—22 Egg-clusters

Two colonies, one of 13 egg-clusters in woodland owned by Fred Gobilot and one of nine egg-clusters in woodland owned by A. B. Curtis were the only infestations of gipsy moth found in Sharon this year. Both colonies were located in the southwestern end of the town near Skiff Mountain. Altogether fifteen and one-half acres of woodland were sprayed at both places by Federal men.

The towns of Litchfield and Winchester were also scouted and no infestations found.

FAIRFIELD COUNTY

The only town in this county where any gipsy moth work was done this year was Greenwich. In 1926 a large infestation was discovered there; clean-up work was carried out and when the town was scouted again in 1927, nothing was found. This year the work was confined to the area around the old infestation and again nothing was found so it is hoped that the colony has been eradicated. This work was done by Federal men.

NEW HAVEN COUNTY

Wallingford—1 Infestation—4,505 Egg-clusters

Wallingford was again found to be infested with the gipsy moth when a Federal crew scouted the town this year, a woodland colony of 4,505 egg-clusters was discovered in the north-

western corner of the town near the Meriden and Cheshire lines. This was the only infestation found in the county this year although 17 other towns were scouted by Federal men. At the colony in Wallingford the dead wood and brush was cut and burned during the late winter and spring to make it easier to spray and thus eradicate this isolated colony. Altogether, 92,800 gallons of spray liquid were used in 130 acres of woodland and a small orchard of 10 apple trees, and it is hoped that the colony has been eradicated.

The seventeen towns scouted in the county were Ansonia, Beacon Falls, Bethany, Cheshire, Derby, East Haven, Hamden, Middlebury, Milford, Naugatuck, New Haven, Orange, Oxford, Prospect, Seymour, Wolcott and Woodbridge.

STATISTICS OF INFESTATIONS 1927–1928.

Towns	No. Infestations Found	No. Egg-clusters Creosoted	No. Colonies Sprayed	No. Lbs. Poison Used	No. Larvae and Pupae Killed	No. Miles Roadway Scouted
Windham County:						
Killingly	54	2,437	4	45	590	29
Scotland	singles	6	0	0	0	34
Sterling	8	405	3	45	0	11
	62	2,848	7	90	590	74
New London County:						
Bozrah	1	970	1	12	25	42
East Lyme†	0	0	0	0	16	
Franklin	0	0	0	0	0	53
Groton	9	76	1	19	412	56
Lebanon	14	3,216	3	42	135	130
Ledyard	0	0	0	0	0	45
New London	15	660	9	70	234	23
North Stonington†	0	0	0	0	342	
Norwich	8	1,007	6	585	0	73
Old Lyme†	0	0	0	0	0	0
Preston	3	157	1	175	0	33
Salem	1	42	1	25	0	46
Stonington	39	5,791	10	1,750	252	52
	90	11,919	32	2,678	1,840	553
Tolland County:						
Columbia	11	3,106	3	150	709	65
Coventry	6	515	2	87	6	102
Ellington	25	704	1	438	11	98
Hebron	8	813	2	850	260	100
Mansfield	34	2,772	3	75	190	99
Somers	19	1,431	9	502	124	69
Stafford	113	4,353	51	1,124	0	159
Tolland	3	119	2	62	5	104
Vernon	2	120	2	112	0	67
Willington	34	1,104	14	110	0	129
	255	15,037	89	3,510	1,305	992

†Scouted by State men around old infestations.

Towns	No. Infestations Found	No. Egg-clusters Creosoted	No. Colonies Sprayed	No. Lbs. Poison Used	No. Larvae and Pupae Killed	No. Miles Roadway Scouted
Middlesex County:						
East Haddam.....	0	0	0	0	0	165
Hartford County:						
Bloomfield†.....	0	0	0	0	0	
Bristol.....	0	0	0	0	0	5
Burlington.....	0	0	0	0	0	9
Canton†.....	0	0	0	0	22	
East Windsor.....	1	1	0	0	0	79
Enfield.....	1	6	1	12	4	96
Granby*.....	24	1,587	9	1,555	545	95
Hartford.....	4	151	2	50	95	167
Hartland*.....	5	385	3	560	39	64
New Britain†.....	0	0	0	0	0	
Rocky Hill.....	0	0	0	0	0	38
Simsbury†.....	0	0	0	0	0	
South Windsor....	0	0	0	0	0	9
Suffield.....	9	259	2	550	94	85
West Hartford....	0	0	0	0	0	6
Wethersfield.....	1	715	1	270	318	45
Windsor.....	0	0	0	0	0	81
Windsor Locks....	0	0	0	0	0	30
	45	3,104	18	2,997	1,117	809
New Haven County:						
Ansonia*.....	0	0	0	0	0	43
Beacon Falls*.....	0	0	0	0	0	23
Bethany*.....	0	0	0	0	0	62
Cheshire*.....	0	0	0	0	0	93
Derby*.....	0	0	0	0	0	32
East Haven*.....	0	0	0	0	0	65
Hamden*.....	0	0	0	0	0	102
Middlebury*.....	0	0	0	0	0	61
Milford*.....	0	0	0	0	0	86
Naugatuck*.....	0	0	0	0	0	66
New Haven*.....	0	0	0	0	0	210
Orange*.....	0	0	0	0	0	57
Oxford*.....	0	0	0	0	0	77
Prospect*.....	0	0	0	0	0	41
Seymour*.....	0	0	0	0	0	55
Wallingford*.....	1	4,505	1	4,640	0	131
Wolcott*.....	0	0	0	0	0	51
Woodbridge*.....	0	0	0	0	0	55
	1	4,505	1	4,640	0	1,310
Litchfield County:						
Barkhamsted*.....	4	748	2	450	0	84
Canaan*.....	0	0	0	0	0	(1,082 acres)
Colebrook*.....	1	46	0	0	0	70
Cornwall*.....	9	280	9	9,650	0	104
Goshen*.....	1	1,626	1	1,825	0	90
Harwinton†.....	0	1	0	0	0	
Litchfield*.....	0	0	0	0	0	140

*Scouted by Federal Men.
†Scouted by State men around old infestations.

Towns	No. Infestations Found	No. Egg-clusters Creosoted	No. Colonies Sprayed	No. Lbs. Poison Used	No. Larvae and Pupae Killed	No. Miles Roadway Scouted
Litchfield County—*cont.*						
New Hartford†....	0	0	0	0	0	
New Milford*.....	0	0	0	0	0	(1,518 acres)
Norfolk*.....	7	162	5	2,595	0	85
North Canaan*....	3	68	1	100	0	56
Plymouth†.....	0	0	0	0	0	
Salisbury*.....	1	16	1	920	1	110
Sharon*.....	2	22	2	1,120	0	140
Winchester*.....	0	0	0	0	0	100
	28	2,969	21	16,660	0	979
Fairfield County:						
Greenwich‡.....	0	0	0	0	0 (12 acres)	

SUMMARY OF STATISTICS

County	No. Towns Covered	No. Infestations Found	No. Egg-clusters Creosoted	No. Colonies Sprayed	No. Lbs. Poison Used	No. Larvae and Pupae Killed	No. Miles Roadway Scouted
Windham..	3	62	2,848	7	90	590	74
New London	13	90	11,919	32	2,678	1,840	553
Tolland....	10	255	15,037	89	3,510	1,305	992
Middlesex..	1	0	0	0	0	0	165
Hartford...	18	45	3,104	18	2,997	1,117	809
New Haven.	18	1	4,505	1	4,640	0	1,310
Litchfield..	15	28	2,969	21	16,660	0	879
Fairfield...	1	0	0	0	0	0	0
	79	481	40,382	168	30,575	4,852	4,882

Parasite Work

This branch of the work is carried on year after year in cooperation with the Federal laboratory at Melrose Highlands, Mass. In the Report of the Connecticut Agricultural Experiment Station for 1922, page 313, will be found brief accounts of the different species of parasites and the matter need not be repeated here. This year, the egg parasite, *Anastatus bifasciatus*, only was liberated, and the following table gives the towns and number of individuals liberated in each town. The method previously followed in trying to get these enemies of the gipsy moth established has been to put them out at places where the moths are abundant and a year after make collections of egg-clusters if they could be found, to see if any of the parasites could be recovered. A large number of the towns in the eastern end of the State have been so treated and but few recoveries have been made, so this year another method is being tried. Thus in Thompson, two plots of woodland, one of 84 acres, the other of 48 acres, and in Eastford

*Scouted by Federal men.
†Scouted by State men around old infestations.
‡Scouted by Federal men around old infestatoins.

a plot of 50 acres, were laid out in one and two-acre sections. There was also a check plot laid out in each town, and all plots were then scouted for egg-clusters and the average number in each plot estimated. Then the parasites were planted according to the degree of infestation. Collections have been made at the different plots this winter but as the results have not been fully tabulated at this time, a more complete report will be made at a later date.

LIST OF TOWNS AND NUMBER OF ANASTATUS PARASITES LIBERATED IN EACH TOWN DURING SEASON, 1927–1928

Towns	No. of Individuals
Thompson*	104,000
Eastford*	50,000
Mansfield	99,000
Willington	41,000
Coventry	25,000
Hebron	35,000
Columbia	71,000
Lebanon	40,000
Stonington	35,000
	500,000

DEFOLIATION

Up to this time there has never been any noticeable defoliation of trees in Connecticut by gipsy moth caterpillars. Yet we are confident that hundreds of acres would have been defoliated long before this had the insect not been kept in check by the suppression work conducted by the State. In 1924 we were very optimistic regarding the parasites which seemed to be making themselves felt in many localities where they apparently caused an actual reduction of the gipsy moths. But something has happened to the parasites since 1924. In 1925 they were much less abundant and the gipsy moth became more prevalent, and the following year there were large stripped areas of woodland in Massachusetts. In 1924, about 825 acres were defoliated in Massachusetts, this being considered the minimum for 20 years. In 1928, occurred the most severe defoliation in recent years, estimated at 262,000 acres, about half of the area being in Massachusetts and the other half in New Hampshire and Maine.

Present conditions are very grave and there should be no reduction in suppression work for the next few years.

QUARANTINE

No new towns have been placed in the quarantined area in Connecticut during the past year, but 31 towns shown in Fig. 57,

*Thompson and Eastford were used for re-colonization experimental plots.

formerly in the lightly infested quarantined area (colored green on the Federal map) have been placed in the generally infested area (colored red on the Federal map). These towns are as follows: Barkhamsted, Litchfield County; Bloomfield, Canton, East Granby, Glastonbury, Granby, Hartford, Hartland, Simsbury, Suffield, Wethersfield, Windsor and Windsor Locks, Hartford County; Andover, Columbia and Hebron, Tolland County; Bozrah, Colchester, Franklin, Griswold, Groton, Lebanon, Ledyard, Lisbon, New London, North Stonington, Norwich, Preston, Sprague, Stonington, and Voluntown, New London County.

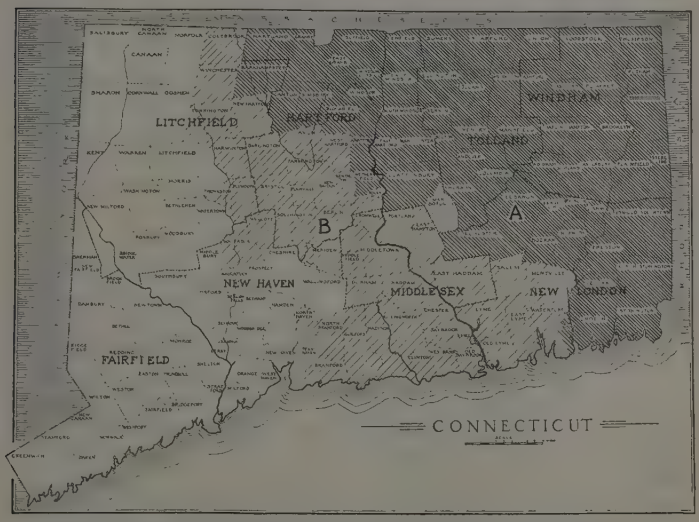

FIG. 57. Map of Connecticut showing present quarantined areas. A, generally infested; B, lightly infested.

RECOMMENDATIONS

In view of the present situation, we felt like requesting an increased appropriation for gipsy moth work for the biennial period ending June 30, 1931, but later decided to ask for the same amount as granted for the present biennium, but in doing so to also file a statement calling attention to the gravity of gipsy moth conditions at the present time. We therefore recommend that an appropriation of $100,000.00 be granted for the next two years, by the General Assembly of 1929. We believe this to be inadequate and that some noticeable defoliation may occur in 1929 or 1930.

NOTES ON FRUIT INSECTS IN 1928

By M. P. Zappe

During the spring and early summer of 1928, some observations were made on fruit insects while visiting orchards throughout the State. At harvest time some fruit in each of a few orchards was scored to check up on the early observations and to see how successful the fruit growers had been in carrying out their spray programs.

The European red mite, *Paratetranychus pilosus* C. and F., was quite abundant early in the season. Many eggs were seen at Bantam, Cheshire, East Hampton, Guilford, Hamden, Madison, Milford, New Canaan, South Glastonbury, Southington, Unionville, Wallingford and Wilton. From the numbers of eggs present, it looked as though there would be a heavy infestation by the middle of summer, but the mites did not reproduce as fast as expected, probably due to weather conditions. Only in one or two cases were mites present in large enough numbers to cause injury. Late in the fall, however, there were many eggs present on the trees and many apples at harvest time had mite eggs in the calyx cup.

Aphids were very scarce in the spring. On some trees where counts were made, only about one aphid per ten buds could be seen. Many of these had been killed by the delayed dormant spray applied by the orchardist. Not many aphids developed during the summer and practically no injury to fruit resulted.

Leaf hoppers hatched in about the usual numbers in the spring, but the wet weather was unfavorable for their development. By the middle of July, many had been killed by a fungous disease and were left dead upon the leaves.

Fall cankerworms, *Alsophila pometaria* Harris, were present in the orchards early in the season doing a little damage in Durham, Hamden and South Glastonbury. Orchards that received the prepink and pink sprays showed very little cankerworm injury.

The plum curculio, *Conotrachelus nenuphar* Hbst., did the usual amount of damage this year. Apple orchards near peach orchards always show the largest amount of damage nearest the peach orchard. Many curculios are produced in the early dropped peaches and these often come into the apple orchard. Wild apple trees that are never sprayed are another source of infestation. Fruit scored from several orchards during the fall showed that there was considerable injury caused by curculios. Most of this injury, however, would not be so great as to reduce the value of the fruit. In most cases where the infestation is very heavy, some of the fruit is worthless and is thrown into the culls.

In Cheshire, Baldwin apples from four orchards were scored and 12, 16, 17 and 22 per cent of the fruit was marked by cur-

culios. In Branford two orchards showed three and eleven per cent injured, and in East Wallingford three, seven, and 14 per cent. All fruit scored was from sprayed trees.

Several vineyards in South Glastonbury were severely injured by the grapevine flea-beetle, *Haltica chalybea* Ill. The injury is done by the adult insect which eats out the swelling buds in early spring, thus destroying the embryonic fruit clusters. The injury is usually most apparent on the outside rows of the vineyard and on the ends of the rows. When the vines leaf out, both adults and larvae feed on the leaves. This insect also feeds on wild grapes and Virginia creeper. The remedy is either hand picking of the early adults, or spraying with a heavy dose of arsenate of lead, two pounds of dry poison per 50 gallons of water. This should be applied when the first beetles appear. After the vines have leafed out, another application of arsenate of lead will kill the young larvae. This will reduce their numbers so that fewer adults will be present the following year.

PLANT BUG INJURY TO FRUITS

By Philip Garman

During June, 1928, peaches on several trees growing on the Experiment Station grounds in New Haven were noticed to be injured severely by a kind of puncture which caused small sunken areas from which gum exuded. As a result of this attack, practically all of these peaches either dropped from the trees or were so deformed as to be worthless. The peach trees are situated near the west boundary of the Station grounds and nearby on the adjoining premises are several black oak trees of medium size. On investigation, it was found that plant bugs of the family Miridae, had migrated from the oak trees to the peach trees and were responsible for the injury to the fruit. The main migration from the oaks which were not over 50 feet away came in June when an examination of the fruit showed the bugs present and sucking the juices. On these peach trees 100 per cent of the fruit was affected.

Preliminary tests were made with nicotine dust as a control and it was found that the bugs could be brought down from the trees with this material though not all were killed. Numerous applications would probably have to be made to keep the trees free at the time when the insects are migrating. According to observations made by Caesar and Ross, there is little danger to trees planted a hundred yards or more from oaks. This fact should be considered in laying out a new orchard of peach trees, and has important bearing in case removal or treatment of the nearby oaks is thought expedient.

The species involved are *Lygus quercalbae* Knight and *Lygus omnivagus* Knight, both of which were found infesting the

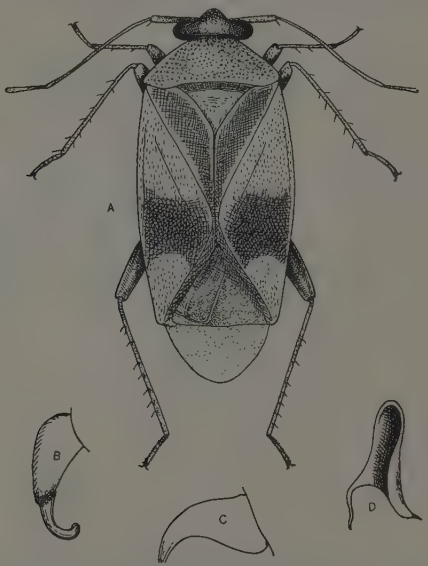

FIG. 58. A plant bug, *Lygus omnivagus* Knight which injured peaches. A, adult bug; B, right clasper, ventral aspect; C, left clasper, lateral aspect; D, left clasper, dorsal aspect.

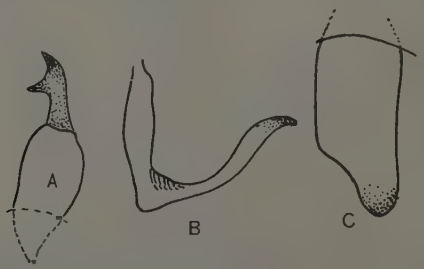

FIG. 59. Genitalia of *Lygus quercalbae* Knight. A, right clasper, ventral aspect; B, left clasper, dorsal aspect; C, left clasper, lateral aspect.

peaches at New Haven. They are closely related species and similar in general appearance, the species *L. omnivagus* being represented in Fig. 58, and the damage to the fruit on Plate XXI.

Injury of the type described is also credited to *L. caryae*, Knight, a species normally developing on hickory, and of course, the common tarnished plant bug, *L. pratensis* Linn., developing on weeds of various kinds, sometimes causes trouble. The injury by these pests is known as "cat-facing" in some sections due to the peculiar formation of the peach sometime after the damage has been done. On pears, damage appears to result in deformed fruits rather than the "cat-faced" condition, and in some orchards appears to be worse with the Bosc variety than others.

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THE ORIENTAL PEACH MOTH

By Philip Garman

The Oriental peach moth, *Grapholitha* (*Laspeyresia*) *molesta* Busck, was active in Connecticut in 1928, becoming very destructive in some orchards where little damage was done heretofore. In a few orchards it decreased in abundance, due probably to continued action of parasites and certain orchard practices of the growers. It has now been present in some orchards of East Wallingford for four years, causing a percentage of wormy fruit variously estimated at 50-100 per cent. In a few orchards within the heavily infested district, the pest has been slow in establishing itself, not having as yet become commercially important.

The areas where commercial damage was done in Connecticut are shown on the map (Fig. 60), the shaded portions indicating limits of commercial damage. The greatest damage last year was done in the south central district indicated by the heavy black. Orchards in this area varied in their degree of infestation, but the worst affected ranged from 50-100 per cent in Hileys and Elbertas. The pest was reported this year for the first time to be doing commercial damage in New London County. In Hartford County the infestation is still uneven, but some orchardists experienced severe losses. Fairfield and New Haven counties seem to be about the same as last year with perhaps more orchards on the whole infested. The infestation was particularly severe in quinces, practically every quince orchard in New Haven county

being infested, with much wormy fruit appearing on the local market. Quinces seem to be particularly attractive to the moths as indicated by the number of larvae obtained from a single bushel of discarded fruits. Over 600 were obtained from this bushel and it was estimated that fully 1,000 were originally present because of the number of exit holes found in the fruit when obtained.

At our suggestion, one orchardist, Mr. S. R. MacDonald kindly dusted his quinces four times at weekly intervals beginning August 10. Another grower, Mr. J. H. R. Bishop, alternated sprays

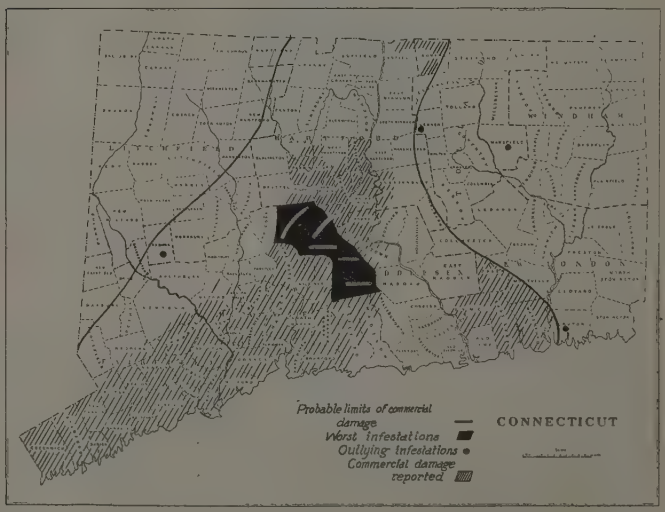

FIG. 60. Map of Connecticut showing distribution of the oriental peach moth in 1928.

with dusts beginning about the same date and making four applications in all. Both treatments failed to control the peach moth. In addition, two trees at the Experiment Station were used, one receiving five sprays of lead arsenate (1 oz.-2 gals.) on the following dates—August 9, 15, 25, 31 and September 8. Fifty-two per cent of the fruit was found to be wormy on examination and 111 larvae were obtained from the sprayed tree, whereas 96.1 per cent of the check fruit was infested and a total of 146 larvae found on examination. The latter test indicates some reduction, but inasmuch as it involves only two trees cannot be considered significant until confirmed by further experiments.

During 1928, tests were begun with ovicides and repellents and it was found that a materially increased kill could be obtained with one per cent white oil emulsions combined with various contact poisons, over that previously reported for nicotine-soap combinations. The most successful this year was a combination of white oil emulsion and pyrethrum soap, it being noted that many of the young larvae walking over the material were killed. The re-

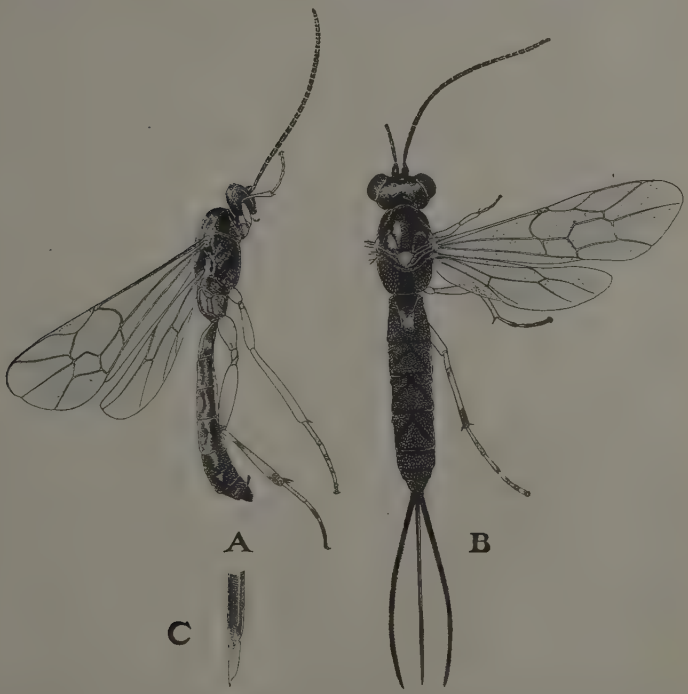

FIG. 61. *Glypta rufiscutellaris* Cresson, a parasite of the oriental peach moth. A, adult male, side view; B, adult female dorsal view; C, tip of female ovipositor.

sults of several years' tests with lead arsenate and fluosilicates and some of the fluorides indicate that these are effective killing agents for the recently hatched larvae. Perhaps the most promising yet discovered, however, has been reported by Dr. Driggers of the New Jersey Experiment Station, who reports the successful use of talc and mica dusts. Since these are very cheap and non-injurious, they should prove valuable in combatting the peach moth.

Dr. Stearns of Ohio has experimented with heavy lime sprays and finds them successful in reducing the infestation. He uses as much as 25 pounds of lime in 50 gallons of water. About 12 different dilute combinations were tried on the overwintering larvae in 1928 without success. Mr. Ross of Canada, however, reports a very good kill of these larvae with certain tar acid oils used at 10-15 per cent strength. Bait pans continue to be used in indicating the different broods, but no experimenters have yet obtained any great reduction in infested fruit from their use. They should form a valuable adjunct to the spray schedule in indicating the best time for spray applications.

Limited investigations were carried on with parasites and collections made from various orchards to determine the amount of parasitism. In general, it may be stated that those orchards most heavily infested had fewer parasites, which was particularly true of the Rogers orchard at Southington and the Young orchard at East Wallingford. Very few parasites of the second brood larvae infesting twigs yere found. The most important parasite found this year was *Glypta rufiscutellaris* Cresson (Fig. 61) which was obtained at New Haven late in the season. The parasite began emerging August 29 and continued until October 18. Larvae of the peach moth were exposed in cages with the parasites and oviposition observed by Mr. J. F. Townsend, the female inserting the ovipositor in the end of an infested twig. The egg parasite *Trichogramma minutum* Riley was observed early in the season by Mr. Walden who found it parasitising the eggs of the imported currant worm (*Pteronidea ribesi* Scopoli) on June 4. The same parasite was obtained in field cages from the eggs of the Oriental peach moth beginning July 26 and continuing until September 24. Parasites emerged from eggs parasitized on the latter date but did not hibernate.

CORN BORER CLEAN-UP OPERATIONS ON THE 1927 INFESTATIONS

By M. P. Zappe

The work of cleaning up the infestations of the European corn borer found in 1927 was begun in the fall of 1927 when the infested corn and weed areas in the towns of Milford and Oxford were burned. During 1928 no infestations were found in either of these towns.

The other 1927 infestations were all in the southeastern part of the State in the shore towns of Stonington, Groton, and East Lyme. These towns have been infested for several years, but no spread has been found outside their borders.

Actual burning work started in East Lyme on March 15, and, though machinery and men were ready to work a few days earlier, weather conditions prevented it. Work in East Lyme was completed on March 26. In this town the village of Niantic was generally infested and a few infestations were on the Crescent Beach road south and west of the village. The infestations were mostly in backyard gardens and in some small fields of corn just outside the village. Most of the work was done with hand burners. A machine burner was used in some of the larger fields, but was not very satisfactory because the fields were too small to make its use economical. The machine burner consists of a battery of nozzles on a long pipe through which the oil is forced. Just behind the nozzles is a large metal shield to protect the men from the heat. This is all mounted on wheels and is drawn very slowly over the fields of infested material by several men. About 35 acres of corn and weed areas were burned in Niantic, requiring 231 man days to complete the work.

From Niantic the burning crew was shifted to the town of Groton where there were two centers of infestation. One was on the top of Fort Hill and the other in the village of Noank. At Fort Hill the machine burner was used in one large field. Other fields had been plowed. The corn that was not completely plowed under was picked up and burned. There was much corn in a pasture, which had been partly eaten by cows. The uneaten portions were raked and picked up and were burned without the aid of any oil. At Noank all infestations were in backyard gardens and all clean-up work was done with hand burners. Approximately 12 acres of gardens were either cleaned by raking and picking up infested material or burned without any preliminary raking. It required about 133 man days to clean up the town and the work was done between April 14 and April 21. In the town of Stonington, there were five centers of infestation. One was south of Mystic railroad station in a small market gardening section. The largest fields were machine burned and smaller areas were burned with hand burners as were the edges of the larger fields. Another infested section was north of Mystic about half way between Mystic and Old Mystic. This area consisted of fairly large fields of corn and weeds and was burned by the carriage burners except for a few small areas and around the edges of the fields. This section was infested in 1925 but no infestations were found in 1926.

One infested area was at the Industrial Place, Mystic, where the infestations were found in small gardens and in one large cornfield near the infested gardens. This area was also infested in 1926. Small backyard gardens were burned over with hand burners and the large fields with machine burners.

Another infested section was just north of Stonington borough and was mostly in small back yards. Both machine and hand burners were used here. This area was almost continuous with the next which was at Wequetequock. These were only about one mile apart. At the Wequetequock section machine burners were used almost entirely except for the edges of the fields. About 70 acres of land were burned over in the town of Stonington, requiring 288 man days to complete the clean-up.

During the spring clean-up work, the United States Department of Agriculture paid for all the oil used and furnished all burning equipment. The State paid for all labor with the exception of the last week's work which was paid for by the Federal Government. All clean-up work was completed on April 21.

Plates XXII and XXIII show the burning apparatus and how it is operated.

Infestations of 1928

During the summer nearly the entire State was scouted for the European corn borer by scouts employed by the United States Department of Agriculture. Of the 169 towns in the State only 44 were not scouted and these were located in the center of the State. All the towns around the edge of the State were scouted with the exception of Kent in Litchfield County. A total of 30 towns were found infested, most of them in New London and Windham Counties.

The following towns were scouted and found to be infested with the European corn borer in 1928. Suffield in Hartford County; Clinton, East Haddam, Essex, Old Saybrook, Saybrook, and Westbrook in Middlesex County; Bozrah, Griswold, Ledyard, Lisbon, Montville, North Stonington, Norwich, Preston, Salem, and Voluntown in New London County; Canterbury, Killingly, Plainfield, Putnam, Scotland, Sterling, Thompson and Windham in Windham County; East Lyme, Groton, New London, Stonington, and Waterford in New London County were not scouted, but have been infested for several years, and it is safe to say that they are infested now.

The scouting showed that there was a large spread westward from Rhode Island of the double-brooded strain of the European corn borer. The general spread westward from infested towns in Massachusetts and New Hampshire was very slight as only one new town was added in Massachusetts and two in New Hampshire but the spread from Rhode Island into Connecticut was very great.

The eastward spread of the single-brooded strain in New York, western Massachusetts and Vermont was quite general and in some cases covered as much as 40 miles.

The town of Suffield in Hartford county was found infested by the one-brooded strain of the European corn borer apparently coming into the state from Massachusetts. The other infested towns are of the double-brooded strain. All towns along the Rhode Island boundary were found infested and in some cases several towns west of the State line were also infested.

It will be necessary to revise the present quarantine area before the next growing season.

REPORT OF SCOUTING AND QUARANTINE ENFORCEMENT FOR THE JAPANESE BEETLE AND ASIATIC BEETLE

J. Peter Johnson*

Japanese Beetle

During the summer season of 1927, Japanese beetles were found in New Canaan and Bridgeport. This caused an extension of the quarantine area eastward from Greenwich and Stamford, to include Darien, New Canaan, Wilton, Norwalk, Westport, Weston, Easton, Fairfield, Bridgeport, Trumbull, Stratford and Shelton. No further extensions were made and the area remained the same throughout the year of 1928.

The general procedure followed in carrying on the work was the same as that carried on during the past year. The infestations in Bridgeport and Stamford had increased considerably and beetles were found there more readily and in larger numbers. Only three beetles were found in New Canaan in the same location where one was found during 1927.

Below, a concise report is given of the work performed during the past year.

SCOUTING

On July 5, 1928, twenty-two men reported for scouting work, at the Shelton office. These men were divided into five field crews of four men each, and one greenhouse scouting crew of three men, one of whom reported earlier for training. The supervisor in charge of the field scouts, who had also reported earlier, took all the men to Bridgeport, where he and one of the permanent men gave them a schooling for ten or twelve days. Individual crews were assigned to their territories outside of the quarantined area, as their proficiency in scouting warranted.

*Mr. Johnson has had general charge of this work for the State of Connecticut and for the Federal Plant Quarantine and Control Administration. He has been authorized to employ and discharge men as needed for the benefit of the Service. For the most part, the scouts and patrolmen have been carried on the Federal payroll. [W.E.B.]

The State was divided into scouting areas, to be covered by crews assigned to them. These areas in a few cases overlapped, to enable another crew to assist, if necessary. The divisions were made according to the number and size of towns surrounding a given point, also upon the movement of traffic and the distribution of farm products. This enabled us to approximate the territory that could be covered by a crew or crews, during the entire season. In some cases one crew covered two or more areas; for example, the crew assigned to the Danbury area upon completion of the work was moved to Waterbury. It was necessary to place two crews in New Haven, in order to complete the area in good season.

Upon completion of the schooling, the crews were placed as follows: one in Danbury, two in New Haven, one in Meriden and one in Hartford. Some time after these crews were assigned, additional funds were available and two more crews of four men each were employed. One was assigned to New London and the other to Manchester. The procedure then followed was to the effect that the larger towns were first scouted and then all surrounding smaller towns in the vicinity. Changes in location were made as soon as that particular area was completed. This method enabled us to scout practically all towns of large size, with the exception of Putnam, Thompsonville and Norfolk.

The supervisor in charge of the field scouts, visited the crews daily, assigning and checking their work and aiding when possible. He was also in close contact with the office concerning all phases of the work.

The crew of three greenhouse scouts, including the foreman, scouted all classified concerns, within the quarantine area. A car was assigned to this crew and this enabled them to cover their area twice a week, meaning that each classified concern was scouted twice a week during the entire season.

Contact scouting for the purpose of keeping informed of the conditions of old infestations for the increase of numbers and possible spread, was performed in Bridgeport, Stamford and New Canaan. This was done by the farm products inspectors, when their work was slack, and by other members of the force when possible.

The area scouted during the season of 1928, included the following towns:

Ansonia, Bethel, Branford, Bridgeport, Bristol, Cheshire, Cromwell, Danbury, Danielson, Derby, Devon, East Hartford, East Haven, East Norwalk, Guilford, Hartford, Madison, Manchester, Meriden, Middletown, Milford, Milldale, Newtown, Norwalk, Norwich, New Britain, New Canaan, New Haven, New London, New Milford, Plainville, Plantsville, Ridgefield, Rockville, Sey-

mour, Southington, South Manchester, Stamford, Stonington, Stratford, Thomaston, Torrington, Wallingford, Waterbury, Watertown, West Haven, Westport, Westville, Willimantic, and Westerly, R. I.

The locations of Japanese beetles found outside of the quarantined area of 1928, were as follows:

NEW HAVEN

Address	Beetles found	Date found
Mapledale Section, Evergreen Cemetery	14	July 21, 1928
Mapledale Section, Evergreen Cemetery	4	July 23, 1928
260 Howard Avenue	1	July 24, 1928
Total	19	

HARTFORD

Address	Beetles found	Date found
38 Sumner Street	5	Aug. 4, 1928
29 Sumner Street	4	Aug. 4, 1928
32 Sumner Street	3	Aug. 4, 1928
Total	12	

NEW LONDON

Address	Beetles found	Date found
29 Brainard Street	11	Aug. 6, 1928
29 Brainard Street	11	Aug. 10, 1928
29 Brainard Street	2	Aug. 13, 1928
25 Brainard Street	1	Aug. 13, 1928
29 Brainard Street	2	Sept. 4, 1928
Total	27	

The total number of beetles found outside the generally infested area was 58.

In conjunction with the field scouting, there was a total of 52 classified establishments scouted. There were not any beetles found.

There were also 12 sand, soil and manure establishments scouted and no beetles found.

The first beetle was found July 5, while the last one was found on October 13, 1928.

There were seven crews of four men each, one crew of three men under the direction of a supervisor, employed in the scouting.

FARM PRODUCTS QUARANTINE

1. General Survey and Discussion.

Just prior to June 15, 1928, a platform, ten by thirty feet, with a roof to provide shelter, was erected at the foot of Wall Street,

Bridgeport, Conn., near the railroad tracks and the Bridgeport market, as a center for all farm products inspections in Bridgeport and the surrounding towns. Shortly after June 15, when the farm products quarantine went into effect, there were three inspectors assigned to it. It was open from 5:00 a. m. to 5:00 p. m. with the exception of Saturday afternoons and Sundays. The three inspectors began work at different hours and worked eight straight hours, eating their lunch at the platform. Two men reported at 5:00 a. m. leaving at 1:00 p. m. while the third inspector reported at 9:00 a. m. leaving at 5:00 p. m. This gave the service of three inspectors at the peak of the rush hour and left one man after 1:00 p. m. when things were slow.

Arrangements were made with a commission house in Norwalk and also one in Stamford at each of which an inspector was available during the morning. These inspectors took care of all farm products inspection from their respective areas and all individual requests for inspection were referred to them.

Inspection was also carried out from the Shelton office. As a man was always assigned to the office besides the clerk, the inspections were made promptly.

The assigning to these four inspection points certain parts of the area enabled inspections to be given rather efficiently. In the majority of cases people desiring inspection were referred to the inspectors within their area and in some cases inspections were made at the point of shipment when they could be made there more efficiently.

The farm products supervisor visited the points of inspection daily and assisted in inspection during busy hours. He also scouted farm territories to find whether or not beetles were present in the areas from which products were shipped directly from the farm to points outside the quarantined area.

In conjunction with the farm products inspection, we had eleven road inspectors and one supervisor. Three crews of two men each were on duty at the Milford-Stratford bridge, Devon, Conn., twenty-four hours a day, seven days a week, on the Boston Post Road. At the Shelton-Derby bridge on the road from Bridgeport to Waterbury, there were three crews of one man each on duty twenty-four hours, six days a week, excluding Sunday. One road inspector on a mortorcycle patroled the Bridgeport-Newtown road and the Bridgeport-Bethel road, both of which led to Danbury, while another inspector on a motorcycle patroled the Norwalk-Danbury road and the New Canaan-Danbury road.

The road patrol covered all main lines of traffic leading out of the quarantined area into Connecticut, while all other roads led into back country and were more or less impassable and were not subject to daily traffic.

The supervisor of the road patrol visited the crews daily and also checked them at night. He substituted for men when necessary for them to be off duty.

2. Number of men employed in connection with the inspection, and certification of fruit and vegetables, cut flowers and hay and straw.

Location	Administrative	Supervisor	Foremen	Inspectors	Total
Bridgeport	..	1	..	3	4
Norwalk	..	..	..	1	1
Stamford	..	..	..	1	1
Shelton	3	..	..	office	..
Total					6

3. Inspection points, number of packages certified, and number of beetles removed.

Place	Period operated	Hours per day open	Number of men	Packages certified	Beetles removed
Bridgeport	June 15–Oct. 1	12	4	110,125	6
Norwalk	June 15–Oct. 1	8	1	16,831½	1
Stamford	June 15–Oct. 1	8	1	4,490	6
Shelton	June 15–Oct. 1	8	..	27,513½	0
Total			6	158,960	13

4. There were 353 boxes of cut flowers certified for shipment outside of the quarantined area.

5. TOTAL CERTIFICATES USED IN STATE REGULATED AREA

Issued for	Total
Fruit and Vegetables	5,313
Cut flowers	353
Hay and straw	37
Total	5,703

6. Roads posted with quarantined signs in 1928.....33

There was a total of six roads patroled by eleven road inspectors working under one supervisor.

1. Number of vehicles bearing quarantined articles intercepted at the quarantine line, each month and the season total.

Month	Devon	Shelton	Stepney Bethel	Wilton Ridgefield	Total
June 16 to 30	601	270	66	39	976
July 1 to 31	1,160	741	216	100	2,217
Aug. 1 to 31	1,195	742	120	98	2,155
Sept. 1 to 30	692	175	...	...	867
Oct. 1 to 15	55	...	...	...	55
Total	3,703	1,928	402	237	6,270

2. Total number of men employed in connection with farm products at all offices (Inspection, certification and enforcement).

	Administrative	Supervisors	Foremen	Inspectors	Total
Inspection and certification	3	1	..	5	9
Road Patrol	..	1	..	11	12
Total	3	2	..	16	21

NURSERY AND ORNAMENTAL STOCK.

1. Japanese Beetle Quarantine Office in the State of Connecticut and area of jurisdiction under same.

SHELTON (State Headquarters) Hurley Building, Shelton, Connecticut
Townships in Fairfield County:

Bridgeport	Fairfield	Norwalk	Stratford	Westport
Darien	Greenwich	Shelton	Trumbull	Wilton
Easton	New Canaan	Stamford	Weston	

2. There were 58 Nursery and Greenhouse establishments having 1,203½ acres of stock and 473,380 sq. feet of glass, classified for making shipments out of the quarantined area.

3. During the year, 389,914 plants were certified for shipment outside of the quarantined area.

4. A total of 11,030 certificates were used in inspection and certifying plants for shipment.

5. There were 3,663 shipments reported to the 10 states requiring notice of them.

6. Four establishments dropped their classification for shipping out of the area because they found their business was confined within the quarantined limits, or else went out of business.

SAND, SOIL, EARTH, PEAT, COMPOST AND MANURE.

1. A total of 193½ car loads of sand and 60 car loads of manure were certified for shipment outside of the quarantined area.

2. Certificates, totaling 1,469 in all, were used in certifying sand and manure.

SUMMARY

1. Average number of men employed in each different branch of the quarantine work at each office, each month, during the year, 1928.

SHELTON OFFICE

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Scouting	0	0	0	0	0	2	25	29	5	0	0	0
Farm Products	0	0	0	0	0	17	21	16	9	1	0	0
Nursery and Greenhouse	0	2	2	2	2	2	2	2	2	3	3	3
Administrative	2	1	1	2	2	2	2	2	2	2	3	3
Total	3	3	3	4	4	23	50	49	18	6	6	6

2. Total number of each kind of certificates used on shipments of products listed below:

Farm Products	Cut Flowers	Hay and Straw	Nursery and Ornamental	Sand Soil	Peat etc.	Manure	Total
5,313	353	37	11,030	1,179	0	292	18,204

3. Total number of certificates lost or unaccounted for.....23

4. There were no state violations of Japanese beetle quarantine prosecuted during 1928.

REPORT OF ASIATIC BEETLE WORK, 1928

The quarantine enforcement and inspection has been in immediate charge of Mr. Benjamin W. McFarland.

The scouting for the Asiatic beetle, was carried on in conjunction with that of the Japanese beetle. No beetles were found outside of the quarantined area in Westville and none in West Haven, on or around the known infested area. Diggings made in West Haven in the spring showed only two lawns infested. The infestation was much less than when first discovered and was of such a nature that unless a man was stationed there throughout the scouting period, there would be only a slight chance of finding any adults.

The infestation as a whole in Westville, is stronger than that of the spring of 1926, when treatment and control work was started by the State. The control work was carried on during the spring and fall of 1926 and the spring of 1927, which resulted in a check of the degree of infestation. However, during the fall of 1927 and the year of 1928, because of the fact that no extensive control work was carried on, the infestation increased each year and the infestations gained considerably in population, while the lightly infested area assumed proportions which resulted in much lawn injury, which appeared this last fall. This condition existed mainly west of Edgewood Park. However, lawn injury appeared

in the Park rose garden and on a strip of lawn (part of the park system) on Edgewood Avenue between Brownell Street and the Boulevard.

Adults were readily found during the peak of the season in the heavily infested area. The first beetle was found, June 26, 1928, at 304 Yale Avenue, Westville, New Haven, Conn., while the last was found August 29, 1928. There was no record of the exact location at which the last beetle was found.

During 1927 and 1928, rather extensive control experiments were carried on by Dr. R. B. Friend, of this Station, with lead arsenate. The report of his work is published in Bulletin No. 304.

Altogether 55 requests were received during the year from individuals for investigations to determine whether or not their properties were infested and for information regarding control measures. These requests were fulfilled and in many cases control work was instigated.

The quarantined area was patrolled regularly throughout the year, warnings issued to all making excavations of any kind, and information given regarding the quarantine and regulations. In general, as in 1926 and 1927, hearty cooperation was received from those who found it necessary to operate under quarantine regulations.

There were 1,194 plants inspected for shipment during the entire year, and 4,368 package certificates were issued for other plants which were free to move under certificates without inspection.

Approximately 3,281 cubic yards of soil and sand were certified for shipment. The soil came from excavations made in the area and was taken two feet below the surface. The sand was shipped from a certified sand-bank. A total of 4,863 certificates was issued during the entire year.

THE PERIODICAL CICADA OR SEVENTEEN-YEAR LOCUST IN 1928.

Tibicina septemdecim Linn.

Brood No. II of the periodical cicada or Seventeen-year locust appeared in Connecticut in 1928 according to expectations. This insect has one of the strangest and most interesting of all insect life histories. It is also one of the most difficult to study and follow through to its end—a period of seventeen years. It appeared in Connecticut in June 1894, the first summer that the writer lived in Connecticut. No particular attempt was made in 1894 to gather distribution data, but specimens were collected in Branford by Dr. Wm. C. Sturgis, then Botanist of the Station. In 1911, the insect appeared in large numbers, and a fairly complete ac-

count was published in the Report of this Station for 1911, page 296. In 1911, the insect was reported from three counties and 21 towns, shown on the map (Fig. 62), as follows: Hartford County: Avon, Berlin, Farmington, New Britain, Plainville, Rocky Hill, Southington and West Hartford; Middlesex County: Cromwell, Durham, Killingworth, Middlefield and Middletown; New Haven County: Branford, Cheshire, East Haven, Guilford, Hamden, Meriden, New Haven, North Branford, North Haven and Wallingford.

Distribution in 1928

In 1928, this insect appeared in about the same localities as in 1911, though no attempt was made to obtain reports from all of the towns where it appeared in 1911. The members of the Department staff in traveling about the State in the course of their work brought in a number of observations.

The first notification of the appearance of this insect in the State in 1928, was received in a letter from Branford the first week in June. Messrs. Friend, Walden, Zappe and the writer visited the spot on the afternoon of June 5. The insects had begun to emerge along the sides of a road leading from Sagal-lou Farm to the head of Lake Saltonstall. There were no treees in the particular area though trees were not far distant. The adults and pupa shells were resting on grass, weeds and sumac sprouts, none of which were more than two feet tall. This area from which the insect emerged was probably not more than 100 feet long, and considerably less in width. Material was collected and brought to the laboratory.

On June 11, in response to a telephone call from Gaylord Farm Sanitarium in Wallingford, Dr. Friend, Mr. Turner and the writer visited the place in the afternoon. The manager feared that the insect might cause severe damage to the orchards. We found the adults and pupa shells rather common around the farm house and grounds, even on pine trees but could find none in the nearby apple orchard. Workmen reported that pupae were abundant underneath stones in an adjoining pasture a few days before. We therefore turned over hundreds of stones along the pasture fence and collected many pupae, showing that only a portion had emerged. On June 13, a telephone call from Gaylord Farm informed us that the cicadas were much more abundant on trees around the farm buildings than on the date of our visit, two days before.

On June 12, Messrs. Friend, Turner, and Walden visited Rocky Top ridge west of the Station Farm, in the town of Hamden, and collected some adults. The insects were making a great racket there but flew away into the trees when disturbed. A goodly number were collected and brought to the Station.

Some of the insects were found on the ridge north of Lake Wintergreen, on or near the farm of Mr. H. F. Baumgardt, but appeared to be much less abundant in this locality than in 1911.

County Agricultural Agent, Raymond K. Clapp, reported the insect as being present on his farm about two miles northeast of Ive's Corner in Cheshire, and also from C. O. Young's orchard in East Wallingford, and Frank Snow's orchard in North Branford.

On June 17, while driving for pleasure, the writer observed, heard, and collected adults on the road between Clintonville and

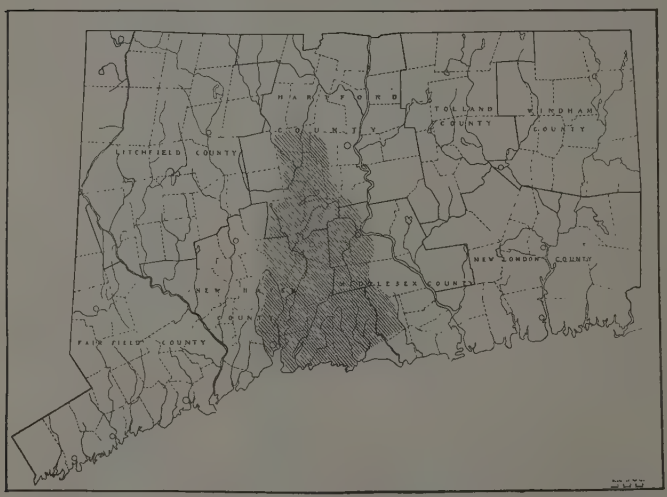

FIG. 62. Map of Connecticut showing area occupied by Brood II of the periodical cicada in 1911.

Northford, probably in the town of North Haven but near the North Branford line. They were making a great racket in a clump of oak trees on a hillside. He also heard them at two places in Guilford east of the Guilford-Durham State road.

Mr. Zappe heard or observed the insects, or afterwards saw the broken twigs caused by their egg-laying habits, on the ridge from Meriden West Peak, Hubbard Park, north to Kensington where considerable injury was caused in one apple orchard; also in Farmington, Southington, North Branford, Middletown, East Berlin, on Higby Mountain, and on the south side of Mount Carmel in Hamden.

Professor J. A. Manter, of the Connecticut Agricultural College, reports that he and Mr. A. F. Schulze saw the cicadas in large numbers in Berlin, New Britain and Southington. One of his students, Mr. C. J. Anderson, reported that he saw them in Haddam and Middletown.

Newspapers reported the periodical cicada as being present around New Britain and Middletown. Thus it is apparent that the insect in 1928 occurred in about the same area as in 1911, as shown in Fig. 62, but in some localities at least it was less abundant than in 1911.

From these locality records, it will be seen that the insect occurred chiefly along the trap-rock ridges in the southern central portion of the State, and all of these localities are in Hartford, Middlesex and New Haven Counties.

Habits and Life History

The females splinter the twigs of trees in depositing their eggs, usually on the under side of the lower branches, as shown on Plate XXV, b. About six or seven weeks after the eggs are laid, the young cicadas as they hatch, drop to the ground and work their way into it twelve to eighteen inches beneath the surface. For seventeen years they live in the ground, burrowing with their forelegs, and for food they suck the sap from small roots between one-eighth and one-fourth of an inch in diameter. During this time, the larvae molt four times, the fourth molt usually occurring about the tenth year. It is very difficult to follow their development and movements, yet this has been done in a few cases by the Bureau of Entomology. When the larvae become mature during the seventeenth year, they work their way toward the surface of the ground, often remaining for days under stones. During this time they are not quiescent, but are quite active and often descend into their burrows out of sight, if one turns over the stone and tries to catch them. When they finally emerge, they do so through circular holes, about three-eighths of an inch in diameter. Sometimes these holes are in hard, well-packed soil such as a walk or the side of a road, and are often close together. In some cases they build up a pyramid or cone two or three inches high around the hole, but none of these were observed in Connecticut in 1911 or 1928. On emerging from the ground, the insect crawls up the trunk of a tree or upon twigs, leaves, stems of weeds, or upon fences or buildings, and soon the skin splits lengthwise along the back and the adult cicada comes forth. At first it is greenish white with soft limp body and wings. It clings to the surface with wings hanging downward, and soon becomes firmer and darker and assumes its normal appearance. The period of emergence extends over about six weeks, and within a week or so after

emergence the adults have mated and the females have commenced to deposit eggs. The old shells remain on the trees or fences for a long time. Sometimes a hundred or more may be counted upon the trunk of a tree. One of these shells is shown in Fig 63, and others on Plate XXVI. As with other species of cicadas, the rattling noise or "song" is made only by the males which have curious diaphragms or drums at the base of the abdomen on the under side of the body. These organs vibrate rapidly, to make the rattling noise.

FIG. 63. Periodical cicada, adults and pupa shell on leaf. Natural size.

DESCRIPTION OF VARIOUS STAGES

Egg. About 2 mm. long, white or pale yellow, transparent, slender, curved and pointed at both ends.

Larva. Dirty white, light brown or yellowish color. A wingless grub, with forelegs modified for burrowing, and with sucking mouth; resembling pupa. More or less hairy.

Pupa. About one inch long, nearly three-eighths inch thick, light brown or tan in color, with prominent legs, the fore pair fitted for burrowing. Head and eyes prominent, antennæ relatively small and inconspicuous. Abdomen large. Thorax and abdomen smooth and shiny. Head and legs hairy.

Adult. Wingspread of about three inches. Body from one to one and one-fourth inches long, about three-eighths of an inch thick. Wings transparent, shiny. Costa bright orange-yellow, other veins fuscous shading to orange at base of wings. Margins and marginal cells more or less fuscous-shaded, the shading and venation at base of marginal cells forming a W near the apex of each forewing. Body dark brown or black above, waxy. Ventral surface of body and legs brown shading to orange. Eyes bright coral red in life, color mostly disappearing in death. Antennæ filamentous, inconspicuous, tapering, 6-jointed, black. The female has a sharp-pointed abdomen with a horny ovipositor folded

up on the ventral surface near the tip. The male has a larger and more blunt abdomen, with a pair of sound boxes or drums on the under side at the base, just back of the rear legs.

The appearance of the adults and pupal shells may be seen on Plates XXV, a, and XXVI, b, and in Figure 63.

Injury to Trees

The effect upon trees caused by hordes of immature cicadas sucking sap from the roots is not well known and consequently cannot be evaluated here. Probably it injures them, but the injury is usually considered as slight, or is disregarded altogether.

The adult cicadas rest upon the bark and leaves of trees, and the stems and leaves of succulent plants, and probably puncture the tissues and suck out a little of the sap, but this is not a serious injury. The chief injury is caused by the females which splinter the twigs with their ovipositors in depositing eggs, as shown on Plate XXV, b. Some of these twigs are weakened to such an extent, that they break off during storms or in a strong wind. The eggs are usually laid in longitudinal rows of punctures along the under side of the twigs of the preceding season's growth, having a diameter of from one-fourth to one-half an inch. Though some of these twigs break off completely and drop to the ground many of them hang and the leaves become dry and turn brown. Sometimes a wooded hillside presents a brown appearance in midsummer from the great number of broken twigs.

In case a young orchard is established on land from which cicadas emerged seventeen years before, or adjoints infested woodland, serious injury may result from the splintered and broken branches. The writer saw such injury to young peach trees in an orchard in Guilford in 1911. Some of the branches do not break and though the scars gradually heal over (see Plate XXVII, a), they are unusually prominent for several years and the branches will always be weaker than uninjured ones. A young orchard injured in this manner should be pruned heavily the following winter or spring in order to remove most of the injured wood and to promote a vigorous growth of new and stronger branches.

Natural Enemies

In Connecticut, no parasites have been recorded from the periodical cicada. The larvae of four species of Diptera or two-winged flies are known to feed upon cicada eggs in the United States. Four species of Hymenoptera or four-winged flies are known to parasitize the eggs, and certain mites feed upon them, but none of these egg-parasites have been observed in Connecticut.

The large digger wasp or cicada killer, *Sphecius speciosus* Dru., kills many cicadas. The adult wasp stings the cicada and carries it away to its subterranean nest to serve as food for the young wasps. The sting paralyzes the cicada but does not kill it, and the wasp lays an egg on the body of the cicada, upon which the young wasp larva feeds.

Probably birds are the most important natural enemies of the cicadas. Members of the Department staff have observed in several places, large numbers of cicada wings upon the ground where birds had devoured the bodies of the insects and discarded the wings. It is commonly recognized by Connecticut farmers that crows do not pull corn during those seasons when cicadas are abundant. Mr. A. W. Butler found 31 species of birds that fed upon the periodical cicada in Southeastern Indiana in 1885; the more important were English sparrow, robin, blackbird, catbird, flicker, red-headed woodpecker, towhee, crow, Baltimore and orchard orioles, and several species each of fly catchers and sparrows.

A fungus described in 1851 as *Massospora cicadina* by Peck, appears on the bodies as a greenish mold, and destroys many adult cicadas, especially males, in some parts of the country, but has not been observed in Connecticut.

Control Measures

In general, preventive or control measures are scarcely practicable against the periodical cicada. If the insect appeared each year in the same localities possibly something might be done, but it comes only once in seventeen years, and is usually forgotten before it comes again.

Small and choice trees may be protected from injury by covering them with mosquito netting.

Applications of insect powder or pyrethrum are fatal to the adults, and this remedy has been mentioned in publications dealing with this insect. It is usually recommended that it be dusted upon the newly emerged adults in the early morning when covered with dew. Dr. R. B. Friend, of this Department, on June 12 counted out 60 well-hardened adult cicadas, placed 20 in each of three cages, and sprayed two lots. One lot received nicotine sulphate (1-500) with soap added; the other lot received pyrethrum extract prepared after Van Leeuwen's formula* which gives oleoresin of pyrethrum at a concentration of about 1-800. The third lot or check was sprayed with water. After three days, four were dead in the check lot and 16 alive; all were dead in both the other cages. There is some evidence to show that trees sprayed with

*Jour. Econ. Ent., Vol. 19, pp. 786–790.

Bordeaux mixture, lime-sulphur, or whitewash are injured considerably less than untreated trees, and therefore such materials may be considered as partial repellents.

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NOTES ON THE NEST BUILDING HABITS OF THE PIPE ORGAN WASP*

BY THOMAS B. OSBORNE

The nest consisting of three tubes cemented together is a part of one of originally five tubes, two of which were broken when removed from a partition in a stable at Washington, Conn., about August 22, 1916. This was fastened to a smooth board in a nearly vertical position with the opening downwards, as indicated in the drawing (Fig. 64, B). About three feet away another nest was being built. When first noticed, this was about one inch long, at 11 a. m. Two wasps were engaged in constructing this nest. One, smaller than the other, and apparently browner in color was inside;[1] the other, black with a blue lustre,[2] worked on the outside, collecting clay and putting each portion in place. The clay was brought moulded into a strip about three-fourths inch long and one-sixteenth inch in diameter. This strip, as near as I could see, was carried on the front leg and held by one end with the jaws. This end was applied to the crotch at the median line of the nest and then rapidly attached to the edge of the piece which had previously been put in place. Apparently it was moulded by the jaws and pressed into position until the end of the strip reached the end of the preceding portion and there came into contact with the board to which the nest was attached. The end was then flattened out against the board, the jaws and fore feet being used to make it adhere firmly. During this process, the wasp inside made a buzzing sound and seemed to be engaged in maintaining a

*During the summer of 1916, Dr. Osborne, head of the Department of Biochemistry of this Station, spent his vacation in Washington, Conn., and became interested in watching some mud wasps construct their nest on a board of the barn. On returning to New Haven he brought me one of the wasps, the nests, and the notes and said that I might use them in any way I saw fit. The wasp was identified by Dr. H. T. Fernald, Amherst, Mass., as *Trypoxylon albitarse* Fabr. (male). The nests were provisioned with spiders which were sent to Mr. J. H. Emerton, Boston, Mass., who reported as follows: "The spiders from wasps nest are all *Epeira trivittata* Keyserling, all females, and half of them adults. They make round webs and live in the tall grass and bushes all over the country". The illustrations on Plate XXVIII are from photographs by B. H. Walden; those shown in Fig. 64 were traced by Dr. Philip Garman from pencil sketches made by Dr. Osborne. Dr. Osborne died suddenly, January 29, 1929, and as these notes had not been published, it was thought best to include them here. [W. E. Britton.]

[1]This looked like Fig. 5, Plate II, *Pelopaeus cementarius*, ♀. Bull. 2, Wis. Geol. and Nat. Hist. Survey.

[2]Like Fig. 3, Plate II, *Chlorion coeruleum* ♀, *Ibid.*

proper sized bore for the tube under construction. When the clay was attached the larger wasp went inside the tube and the two set up a loud buzzing for a few seconds. It then came out and flew away to return after two or three minutes with another strip of clay which was put in place on the opposite edge of the opening of the nest. This process was continued. Each time the outside wasp returned it struck the wall about three or four feet from the nest, but located the nest after a few seconds by flying about on one side or the other, coming gradually nearer each time as

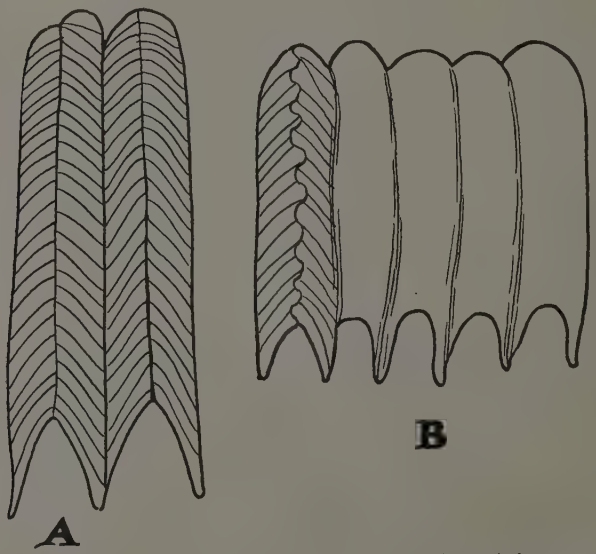

FIG. 64. Nests of the pipe organ wasp. Natural size.

though attracted to it by some invisible force. After every four or five trips by the outside wasp the inside wasp would come out and fly away. When it returned it struck the wall much further away than did the outside wasp and had more difficulty in finding the nest. Whether or not it brought anything with it I could not see. At any rate, whatever it carried was very small. On returning, this wasp went directly into the nest and stayed there until the outside wasp had put three or four more strips of clay in place. I did not see the first tube finished or the second tube begun for I had to go away when the former was about two inches long. About 9 a. m. the next morning the first tube was approxi-

mately three inches long and a second tube had been made which was about one and a half inches long when I first saw it. I watched the construction of the second tube until 11 a. m. when it was as long as the first. When it reached this length the inside wasp set up a very loud buzzing when the outside wasp came back with more clay and apparently made such a fuss that it did not dare attempt to put the clay in place. After attempting several times to do so the outside wasp flew off with the clay and came back again, after a few minutes, apparently without any clay and went inside the nest. It then made regular trips coming back with such small quantities of clay that I was unable to see that it carried anything. When it entered the nest, clay must have been brought because after several trips a partition had been built across the lower end of the tube. I did not see any spiders put into the tube before the partition was completed, but I did not watch them continuously and this may have been done while I was away or it may have been done during the trips of the inside wasp, but I think I would have seen the spiders when it came back to the nest if it brought any. A heavy thunder shower put an end to the work for the day. The next day, no more work seemed to be done and the outside wasp was not seen. One, or both, were in the nest in the afternoon as evidenced by the buzzing which followed on putting a straw into the tube. The tube first made had a partition about one-half inch from its mouth. It probably had two others lower down. Both tubes were attached to the wall in a vertical position with the mouth opening downwards. (Fig. 64, A, and Plate XXVIII).

MOSQUITO CONTROL WORK IN CONNECTICUT IN 1928

R. C. Botsford

Mosquito control work during the season of 1928 consisted largely of supervising the treatment of mosquito breeding areas, and was concerned especially with the ditching of salt marshes. Inasmuch as this season was the greatest for the treatment of new areas since 1916, it seems best to describe in some detail the method of procedure and the part this Station plays in the average mosquito control program undertaken by a community or individual.

Procedure of Mosquito Control Work

Chapter 68 of the Public Acts of 1923 authorizes the Director of the Connecticut Agricultural Experiment Station to investigate the places where mosquitoes breed and to order these areas treated as required to eliminate mosquito breeding therein. Investigation, or a brief survey, to determine the extent of the area to be treated

and the cost of treatment may be made upon request and for this work there is no charge by this Station. But sufficient funds must be provided to complete the treatment according to the survey before the legal order and notice is issued. This order and notice contains a brief description of the plan to be followed and is delivered to record land owners affected to notify them of the proposed work and a copy placed on file with the local town clerk, and also published in a newspaper of local circulation.

Funds for treating the area in question are usually provided from town funds or are contributed by local residents, associations or corporations. The project of mosquito elimination in any community is, as a rule initiated by one or more influential and public-spirited individuals who can give some of their time to a rather educational campaign concerning the absence of mosquito nuisance in relation to real estate values, the improvement or reclamation of swampy land, the raising of sanitary standards, the reduction of malaria cases, and the most effective reason of all—personal comfort out-of-doors and in.

The individual interested usually introduces a motion before the local town meeting requesting town funds for the work, or a house-to-house canvass can be made. Usually a combination of town appropriation and personal subscriptions is very satisfactory. State funds are not available at this time to aid in the labor cost of this work, but a limited amount of time may be given by this Station to aid in making a preliminary survey in supervising the field work and inspecting the work as it progresses.

When sufficient funds are available and it is desirable that this Station supervise the work, it is customary to send the funds to the Station for deposit with the State Treasurer. As the work proceeds, these funds are drawn as required by certified vouchers, and the contractor is paid only for work which merits our approval. Men experienced in mosquito control work and reliable contractors capable of treating large areas effectively are not easily obtained, and unless the work is properly supervised, large sums of money may be expended without obtaining the desired results and when this occurs future mosquito control projects in other communities may become more difficult to develop.

Wherever any land has been drained to the approval of the Director of the Connecticut Agricultural Experiment Station, the drainage works shall be kept in repair at State expense. To carry on this maintenance work, this Station is dependent upon what the General Assembly sees fit to appropriate for that purpose. For the past six years, funds have been so insufficient that some of the work has deteriorated and returned to a mosquito breeding condition and large areas recently ditched and approved could not be accepted for maintenance due to lack of funds. The inadequate funds available for maintenance cannot be prorated effectively over these large added areas of newly ditched salt marsh be-

cause a larger proportion of money would be expended for transportation and much less would be left per acre of salt marsh. Funds which would be sufficient to keep certain contiguous areas in non-breeding condition would be split up if expended over widely separated areas, thus increasing the transportation cost and cutting down the labor per acre. This would necessarily result in allowing small breeding places to exist on all areas, thus leaving all the work incomplete and consequently ineffective. Proper maintenance of ditched or otherwise treated areas is one of the most important phases of mosquito control. Trained men are necessary to keep the work in proper condition. This is especially true in regard to crew foremen who must be intimately acquainted with all the characteristics of the areas under their supervision and know the shortest routes to and from the areas. Several seasons of experience are necessary training for this work and men of this type should be available each season, which makes it necessary in some cases to pay these men through the winter months when no work can be done, in order to have them on hand for the spring work. The table below shows the area in acres of salt marsh under State maintenance in 1928-1929 and all ditched areas which could come under State maintenance in 1929-30 if funds were provided. It also shows the plan necessary for proper patrol and maintenance.

NEW PLAN FOR MAINTENANCE

Town	No. Acres 1927–1928	No. Acres 1929–1930		
WESTERN DISTRICT				
Stamford	200	300	2,500 acres	1 foreman ..$1,330
Norwalk	....	600		2 laborers... 1,440
Westport	....	400		
Fairfield	1,200	1,200		
NEW HAVEN DISTRICT				
West Haven	222	222	3,959 acres	1 foreman ..$1,330
New Haven	675	750		4 laborers... 2,880
Hamden	....	520		
East Haven	50	482		
Branford	578	900		
Guilford	1,085	1,085		
EASTERN DISTRICT				
Madison	1,005	1,005	3,405 acres	1 foreman ..$1,330
Clinton	....	800		3 laborers... 2,160
Westbrook	....	500		
Old Saybrook	....	300		
Old Lyme	....	450		
East Lyme	....	300		
Groton	50	50		
Total	5,065	9,864	Total cost—Labor only for 1 year.	$10,470

NEW WORK

Town	Approx. No. acres ditched	Linear feet of ditches	Cost	Day Labor	Legal Expense	Total Expenditure
Norwalk....	500	14,164	$354.10	$2,860.60	.....	$3,214.70
New Haven.	....	.....	.....	.....	$18.40	18.40
North Haven	....	.....	.....	.....	20.26	20.26
Hamden....	250	98,332	2,461.31	121.35	18.58	2,601.24
East Haven.	300	100,322	2,509.20	1,215.96	22.36	3,747.52
Branford....	317	113,192	2,837.79	352.02	21.98	3,211.79
Madison....	100	31,273	781.83	940.80	.....	1,622.63
Westbrook..	80	34,088	852.21	.....	.....	852.21
Saybrook...	86	39,943	998.59	.....	.....	998.59
Old Lyme...	300	128,330	3,228.25	103.04	11.48	3,342.77
East Lyme..	130	58,423	1,461.48	1,201.89*	19.12	2,682.49
	2,063	618,067	$15,484.76	$6,795.66	$132.18	$22,312.60

WORK OF THE SEASON

The summer of 1928 was a mosquito year, as was also the two preceding seasons. Mosquitoes were very abundant in some localities, in fact, so aggravating that in some of the most conservative townships the electors in open town meetings made generous appropriations for ditching their salt marshes. In 1928, nine towns made appropriations totaling over $25,000 and individuals contributed $7,000 more, making a total of $32,000. (Total of ditches installed 618,067 feet.) The majority of towns turned their funds over to this Station, but some preferred to pay the contractor direct. All details of the work were managed by this Station. The ditching was done in a lump contract and was awarded to John F. Ross, 1660 Putnam Avenue, Ridgewood, N. Y., at two and a half cents per linear foot. Mr. Ross spent practically all of his time on the salt marshes and no important details were overlooked to make the work as perfect as possible. The Deputy in charge inspected the work as it progressed and a high quality of work was maintained. In reviewing the work separately by towns, it is necessary to be as brief as possible and to refer the reader to the tabulation of statistics for details as to acreage, cost, future expenditure and so forth.

WORK DONE UNDER NEW HAVEN CHAMBER OF COMMERCE PLAN

Source of Funds	Resident Contributions	Town Contributions	New Haven Quota		Total	Expended	Balance
Hamden.....	$1,515.00	$2,500.00	$1,272.48	32%	$5,287.48	$2,601.24	$2,686.24
North Haven..	15.00	.....	676.01	17%	691.01	20.26	670.75
Branford.....	321.00	2,500.00	717.77	18%	3,538.77	3,211.79	326.98
East Haven....	35.50	2,500.00	1,113.42	28%	3,648.92	3,747.52	−98.60
New Haven...	3,976.51†	750.00	198.83	5%	948.83	18.40	930.43
C. of C.....	.....	.....	.....	....	300.00	.....	.....

*Fresh water swamp.

†This amount, $3,976.51, including $300.00 contributed by the New Haven Chamber of Commerce, was prorated to all towns according to acreage of area to be treated.

The Work by Towns

NEW HAVEN

As a result of its recent campaign, the New Haven Chamber of Commerce collected $21,232.00 to be used for relieving the City of New Haven from mosquitoes migrating from unditched salt marsh areas in Hamden, North Haven, East Haven and Branford, and for ditching a small area near Morris Cove.

Of this amount $6,000.00 was appropriated by the City of New Haven for straightening and dredging Morris Creek, and in addition the Public Works Department from its own funds built a tide-gate in Little River at Middletown Avenue.

The total publicity expenses, consisting chiefly of printing and distributing printed matter, was deducted from the contribution of New Haven residents, leaving a balance of $3,976.51 to be donated to Hamden, North Haven, East Haven, Branford, and New Haven on an acreage pro rata basis as shown in column four in table. Hamden receiving 32 per cent, North Haven 17 per cent, East Haven 28 per cent, Branford 18 per cent, and New Haven 5 per cent. All funds originating within each of the four surrounding towns were to be expended within their own borders, plus the quotas mentioned above. This Station cooperated with the New Haven Chamber of Commerce throughout its campaign and supervised the ditching work. No new ditching was done in New Haven as it was necessary that the dredging of Morris Creek be completed first.

WEST HAVEN

The town of West Haven aided in maintaining the ditched areas. These areas were reported free from mosquito breeding the entire season. The work was under the supervision of Dr. Charles D. Phelps.

NORTH HAVEN

The town of North Haven failed to furnish funds and the New Haven quota was insufficient to start the work. (See table.)

The City of New Haven constructed a tide-gate on Little River which will protect the North Haven area from flooding by high tides and will facilitate ditching when the time comes.

HAMDEN

The town of Hamden contains 571 acres of salt marsh and is one of the new towns in mosquito control work. The work started near the New Haven town line and continued northward until funds were exhausted. About one-half the area was completed.

The town appropriation of $2,500 will become available for work in 1929. (See table.)

EAST HAVEN

The town of East Haven contains about 545 acres of salt marsh, of which but 50 acres are maintained by State funds. Under the New Haven Chamber of Commerce plan, about 300 acres were ditched this season at the cost of $3,747.52. (See table.) The areas yet to be ditched include the northwest corner of the marsh lying east of Hemingway Avenue, the long narrow marsh from Morris Creek to Hemingway Avenue, and areas near Morris Creek. All shore areas from the East Haven River to Morris Creek are completed. Funds are exhausted and about $1,300 will be required to complete the ditching in East Haven.

The town of East Haven dredged the upper part of Morris Creek, known as Tuttle Brook from the New Haven line north to Main Street. The town also installed a permanent beach outlet at Silver Sands to take the place of a pipe line 1,200 feet long which failed to drain a low area each side of Cosey Beach Avenue. These two improvements are of great importance not only from a mosquito control standpoint but as a sanitary measure as well.

BRANFORD

All salt marshes in the town have now been ditched. The cost of completing this work was $3,211.79 and covered the unditched area west of the Branford River to the East Haven town line. Final inspection only is necessary for State approval. (See table.)

The area east of the Branford River ditched in 1916 was patrolled and the ditches kept open with the exception of the diked Stony Creek marsh which requires reditching. The tide-gate at this location requires extensive repairs.

The construction of the tide-gates on the Branford River at Hubbard's Bridge should be completed. A new permanent concrete sill was installed at the 28 foot opening at considerable expense in 1927 and now new wing walls and new gates are required to make the unit complete.

GUILFORD

All ditches recently recut were patrolled and cleaned and the work of recutting continued. It is estimated that by the fall of 1929 all recutting should be completed and salt marshes in non-breeding condition. The broken dike at Great Harbor was repaired by the property owners and is now in good condition, although the beach is cutting back in another location dangerously close to the dike.

MADISON

Reditching of the salt marsh areas in Hammonasset Park was completed this season at a total cost of $5,554.64. These funds were contributed by the State Park and Forest Commission and eliminated some of the worst breeding places in the town. The large area at Hogshead Point near East River should be reditched as soon as possible.

Corrugated iron pipes installed as beach outlets were somewhat damaged by storms but continue to function.

WESTBROOK

Ditching in the town of Westbrook was completed and sufficient funds remain to overhaul and clean the ditches in the spring of 1929.

OLD SAYBROOK

The town of Old Saybrook at its 1927 town meeting appropriated $1,000 which was expended ditching about 86 acres to the rear of Plum Bank. Another $1,000 was appropriated in 1928 to extend the ditching in 1929. The salt marsh areas recently ditched near Knollwood Beach by Simpson and Cosulich should be patrolled and ditches cleaned where necessary. The area at Fenwick ditched in 1916 should be entirely reditched.

OLD LYME

The town of Old Lyme at its fall town meeting appropriated $5,000 to start ditching its salt marshes. Some funds were made available immediately and ditching was started in the Black Hall section as this was considered the source of the greatest number of mosquitoes.

The marshes on the Black Hall River and at Smith's Neck were ditched and the work well started on Great Island when cold weather put a stop to the work. Total footage of ditches installed to January 16 is 128, 330 feet.

EAST LYME

The summer residents of Black Point in the town of East Lyme raised $3,000 for mosquito elimination in that vicinity. This amount was estimated sufficient in a recent survey by this Station to drain two fresh water swamps and a nearby salt marsh.

In the large brushy swamp on the top of the ridge, a ditch was dug extending from the roadway at the south end of the point northward to a small pond. It may be necessary to dig some spur ditches to distant depressions to make the drainage of the entire

area complete. A narrow fresh water swamp on the west side was ditched and drained by installing a corrugated iron pipe through the beach. The salt marsh west of the Point was ditched to a point a short distance above the wood road bridge (see table).

GROTON

Ditches were cleaned and graded where required and some new spur ditches installed. It is difficult to arrange more than one or two visits to this area a season, due to the distance from the nearest ditched area.

FAIRFIELD

The town of Fairfield cooperated as usual with the State and has aided this Station by supplying men and funds to keep the salt marshes in non-breeding condition. The draining of fresh water swamps continues to expand and has resulted in increased valuation of much property in addition to removing the source of disease-bearing mosquitoes.

WESTPORT

Ditching in the town was inspected and approved by this Station in 1927 but we could not maintain the work due to lack of State funds. The town of Westport however appropriated sufficient funds and employed Nicholas Matiuck to furnish labor and supervise the work. The ditches were patrolled and kept clean and areas requiring oil were sprayed with old crankcase oil as required.

NORWALK

For several seasons past the City of Norwalk has been infested with mosquitoes. At the request of Dr. Purdue, Health Officer, a preliminary inspection was made of the salt marshes and fresh water places. Prolific mosquito breeding was occurring in stagnant pools near the center of the city and immediate oiling was recommended to be followed later by filling or draining. The salt marshes were ditched in 1912 and were in fair condition. This Station recommended thorough reditching to put the work into condition which would pass State inspection. The City of Norwalk appropriated $4,000 for this purpose, of which $3,214.70 was expended this season. The ditching was approved on October 18, 1928.

STAMFORD

The city of Stamford for several years past has appropriated funds for mosquito control work. Some of these funds have been

added to State funds and expended under State supervision in maintaining the salt marsh ditches, and the balance for oiling fresh water swamps.

STATUS OF CONNECTICUT SALT MARSH AREAS, 1928

Town	Salt Marsh Areas	Salt Marsh Ditched	Maintained by State	Total Cost of Ditching	Labor, Cost Maintenance, 1928	Labor, Cost to Complete Ditching
Greenwich	200	200	none	$22,000.00	.....	.....
Stamford	300	300	200	3,245.80	$107.92	.....
Darien	300	300	none	3,800.00	.....	.....
Norwalk	600	600	none	7,500.00	.....	.....
Westport	400	400	none	5,913.82	.....	.....
Fairfield	1,200	1,200	1,200	8,400.00	509.83	.....
Bridgeport	173	....	....	.....	.....	$3,000.00
Stratford	1,315	....	....	.....	.....	20,000.00
Milford	630	....	....	.....	.....	9,500.00
West Haven	463	222	222	*	83.55	3,500.00
New Haven	750	750	675	12,000.00	310.50	750.00
Hamden	571	250	none	2,601.24	.....	2,500.00
North Haven	310	....	....	.....	.....	3,100.00
East Haven	545	300	50	3,747.52	.....	1,300.00
Branford	895	895	578	.....	417.12	.....
Guilford	1,085	1,085	1,085	20,000.00	789.57	.....
Madison	1,005	1,005	1,005	.....	1,777.03†	.....
Clinton	785	677	none	10,000.00	.....	2,000.00
Westbrook	500	500	none	7,428.14	.....	.....
Old Saybrook	1,373	186	none	2,000.00	.....	15,000.00
Lyme	493	....	....	.....	.....	7,500.00
Old Lyme	1,393	300	none	3,342.77	.....	15,000.00
East Lyme	424	130	none	1,480.60	.....	4,000.00
Waterford	204	....	....	.....	.....	3,500.00
New London	34	....	....	.....	.....	500.00
Groton	304	50	50	1,000.00	15.00	4,000.00
Stonington	555	....	....	.....	.....	8,500.00
Totals	16,807	9,350	5,065	$114,459.89	$4,010.52	$103,650.00

*Ditched with New Haven.
†State Park and Forest Commission $1,622.63.

MISCELLANEOUS INSECT NOTES

Larch Sawfly: On July 30, Dr. R. B. Friend visited the Whittemore estate in Middlebury where many European larch trees had been stripped by the larch sawfly, *Nematus erichsoni* Hartig. The larvae had left the foliage and made their cocoons. An outbreak of this insect occurred in 1915, and a full illustrated account may be found in the Station Report for 1915, page 125. Spraying with lead arsenate will prevent defoliation. [W. E. Britton]

Spruce Epizeuxis Injures Blue Spruce: On July 2, 1928, several larvae and pupae of *Epizeuxis aemula* Hubner were collected on some blue spruce trees (Picea pungens) at Woodmont. Several adult moths were reared in the insectary from this material, emerging July 6 and 7. The larvae live mainly on the older needles back from the tips, and their webs and excrement, together with the dead needles, form a dense mat, as shown on Plate XXIX, a and b. A spray of lead arsenate would doubtless prove effective. [R. B. Friend]

The Horse Radish Flea Beetle on Cabbage: Adults of the horse radish flea beetle, *Phyllotreta armoraciae* Koch, were found attacking the leaves of young cabbage plants early in May, on the farm of F. E. Peckham at Norwich. When the plants were examined, most of the insects were on the under side of the leaves lying on or close to the surface of the ground, or in the axils of the leaves. The owner dusted the entire plot with lead arsenate and lime, one part of the former to four parts of the latter by weight, and the number of insects was materially reduced, although no exact experimental data were available. Prior to the planting of cabbage in the spring of 1928, horse radish had been growing on the land for several years. [R. B. Friend]

Say's Blister Beetle Injuring Peach Trees: On June 19, specimens of Say's blister beetle, *Pomphopaea sayi* Fabr., were received from Canaan, together with peach leaves which had been partially eaten by them. The correspondent reported that three young peach trees were covered with the beetles which were rapidly devouring the foliage. Three adult beetles were received. They were nearly three-fourths of an inch long, with head, thorax, and wing-covers dull green, legs honey-yellow, tarsi, knees and antennae, black. This beetle is rather rare in Connecticut and this is the first record of injury caused by it. Of course spraying with lead arsenate is the remedy. The beetle and injured peach foliage is shown on Plate XXIX, c and d. [W. E. Britton]

Weevil on Red Pine: The last of November, 1928, Mr. W. O. Filley, Station Forester, brought in some dead young red pines each of which contained several larvae of *Pissodes approximatus*

Hopkins, in the base of the trunk. The larvae were fully grown and in cells in the wood close to the bark. Adults were reared, emerging in the laboratory insectary January 18, 1929. The trees were about six years old and were part of a plantation in Goshen belonging to the American Brass Company. The infestation was confined to a small group of trees in a swale, and no signs of weevil injury were observed in the neighboring parts of the plantation. Several apparently healthy trees growing among those infested were examined and no indications of the presence of larvae could be seen. All infested trees were dead. This weevil very closely resembles the white pine weevil (*Pissodes strobi* Peck) in appearance. [R. B. Friend]

Abundance of Whiteflies: The mulberry whitefly, *Tetraleurodes mori* Quaintance, or probably its variety *maculata* Morrill, was extremely abundant on native and introduced trees and shrubs in 1928. This insect was observed in many nurseries and the flowering dogwood trees on the writer's premises were quite heavily infested. The air was literally full of flying adults the first half of September. Linden is a preferred host and a thoroughly infested leaf is shown on Plate XXX. On September 9 the writer observed thousands of pupa shells on the leaves of mountain laurel growing in woodland in Bethany. Most of them were clustered along the mid-vein on the under side of the leaves. As the adults had emerged, none could be obtained for identification, but the empty shells bore the characteristics of *mori:* past observations indicate that the variety *maculata* is the more common form in Connecticut. [W. E. Britton]

Carrion Flies Killed by Fungus: During the summer of 1928 the writer was impressed by the great number of metallic green or blue flies found dead and adhering to the leaves and stems of garden plants. Every gladiolus leaf had one or more and other plants bore them also. These flies were killed by a fungus, and were common not only in New Haven, but also in surrounding towns. Mr. E. M. Stoddard, of the Botany Department reported them as being abundant in his own garden in Whitneyville. On July 25, the writer visited a garden at 228 Sherman Avenue, New Haven, where in the rear yard a medium sized magnolia tree had dead flies attached to the outer margins of all the lower leaves, as shown on Plate XXXI. Dr. Friend examined the flies and found that most of them were *Lucilia sericata* Meigen, with an occasional specimen of *L. sylvarum* Linn., and *L. caesar* Linn. These flies breed in waste and decaying animal matter and it is difficult to explain why they were so much more abundant in 1928 than in other seasons. The fungus was identified by Dr. A. A. Dunlap of the Botany Department of Yale University, as *Empusa muscae* Cohn. [W. E. Britton]

Canker Worms in 1928: The fall canker worm, *Alsophila pometaria* Harr., usually causes more or less local damage in certain sections of the State each year. The defoliation of a large area in East Lyme in 1927 was recorded in the Report of this Station for 1927, page 261. During 1928, the damage in this section was less severe, but the infestation extended over a much larger area. In Hamden where canker worms have been abundant for at least two years, there was much less injury during the past season. The largest infestation observed in 1928 occurred from Madison through Clinton, Westbrook and Essex to the Connecticut River and covered several hundred acres. About fifty acres of woodland between Clinton and Westbrook were examined on June 22. The trees were largely oak, maple and birch and were nearly stripped. Practically the only foliage that was left were the mid ribs and larger veins of the leaves. The larvae were about full grown and were spinning down from the trees and attacking the undergrowth. The photograph on Plate XXVII, b, shows the appearance of the trees on June 22. From the highway a wooded side hill to the east for a distance of a mile or more appeared to be in a similar condition. Unsprayed fruit trees throughout the section appeared as though they had been scorched by fire. [B. H. Walden]

Thrips Attacking Cauliflower: On September 14, a report was received that a large field of cauliflower, belonging to a market gardener in Southington, was badly infested with thrips and a visit was made to the place the same day. In one field of about thirty acres, the plants, instead of forming heads were turning yellow and appeared to be dying. There were many thrips on the leaves, which showed the characteristic work of this insect. Most of the individuals were wingless. The plants were also badly infested with stem rot. Owing to these two troubles it was evident that the plants had been checked to such an extent that they could not be saved by any treatment. The owner had another field of about twenty-five acres of younger plants which appeared to be in a thrifty condition. Though the leaves did not as yet show any serious injury, there appeared to be enough young thrips present to eventually stunt the plants. As the owner had a power duster for dusting field crops, it was recommended that he give these young plants an application of nicotine dust. The thrips, upon examination, proved to be the onion thrips, *Thrips tabaci* Linde. Although this species has been known to attack a number of different kinds of plants besides onions, this is the first record of its attacking and injuring cauliflower in Connecticut. It has, however, been reported as infesting cauliflower seed beds in New York. [B. H. Walden]

The Common Red Spider: The common red spider, *Tetranychus bimaculatus* Harvey (*T. telarius* of many authors), is one of the

most serious pests of plants in greenhouses, and sometimes of garden plants. It frequently develops on plants forced inside and continues to breed after removal to the flower beds outside. Phlox is frequently attacked, damage being most severe in outside plantings in August or September, usually in dry weather. The complete life history has been studied under greenhouse conditions, and it seems probable that life history in mid summer is approximately the same. It is stated frequently in literature, and it is known to occur under some conditions, that the adult mite winters over, not the egg as with other species. The life periods are very short, and development rapid. Vinal states that the total cycle is seven to eight days while the adults live about two weeks, the females depositing 50-60 eggs. This mite and phlox leaves injured by it are shown on Plate XXXVI.

Various means of control may be employed. If the plants are conveniently located, frequent syringing with a fine spray from the garden hose is effective. In other situations, the plants may be sprayed with linseed oil emulsion, white oil emulsion, such as Volck, or dusted with very fine sulphur dust. Liver of sulphur (Potassium sulphide) is sometimes recommended for control of leaf spots, and should no doubt prove of some benefit in controlling the red spider since it deposits, on drying, a very fine sulphur dust on the surface of the leaves. Frequent applications of pyrethrum soaps such as Red Arrow[1] also appear to be effective and non-injurious. The latter treatment is probably safest provided a neutral soap is used but is also the most expensive of the sprays. Syringing with clear water is of course cheapest, but requires frequent repetition to be most effective. White oil emulsions are probably most effective, but are not as safe and recommendation of the manufacturers should therefore be followed closely. [Philip Garman]

A New Greenhouse Pest: During October, 1928 our attention was called to injury to greenhouse plants from a species of Tarsonemus apparently new to this district. This species, determined by Dr. Ewing of the U. S. National Museum by comparison with types, is identical with *Tarsonemus latus* Banks, although differing somewhat from his description. As observed, the species seems to be more active than *pallidus* which it resembles in general form, though being more robust. The fourth pair of legs of the male (Fig. 65) are entirely different from those of *pallidus*, as well as the first pair of legs of the female and the pseudostigmatic organs which are comparatively short and inconspicuouus.

The type of injury is the same as that caused by *pallidus* and consists of a scorched epidermis, sometimes shiny in appearance if compared with the dull surface of unaffected plants. The leaves later begin to curl and young plants may be stunted. The principal

[1]Should be used stronger than the manufacturers recommend, for satisfactory results.

injury thus far observed has been to tomatoes and tobacco plants grown for experimental use in one of our houses. It is a tropical species reported from the Virgin Islands, Florida, and greenhouses in Washington, D. C., and has been previously reported to infest peppers, lemons, citrons and mangos.

The possibility of damage to greenhouse plants from this pest is probably as great as that caused by the cyclamen mite, but the host plants will, of course, be different. Because of its similarity of habits and form it should be controlled by the same measures that control *pallidus:* namely, frequent applications of nicotine

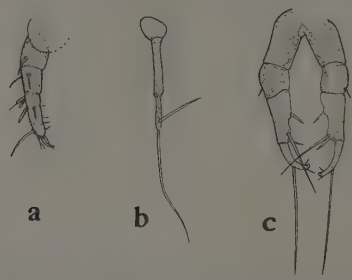

FIG. 65. Structure of *Tarsonemus latus* Banks. a, leg I of female; b, leg IV of female; c, hind legs of male.

sulphate, or naphthalene fumigation as described by Whitcomb and Hartzell. Moznette controlled it in Florida with sulphur dusts.

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[PHILIP GARMAN.]

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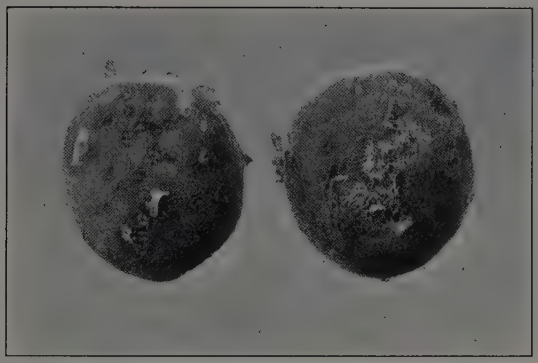


a. Peaches injured by oak plant bugs, natural size.

b. Section of peach showing injury by oak plant bugs, natural size.

WORK OF OAK PLANT BUGS.

a. View of burning apparatus.

b. Another view of same apparatus.

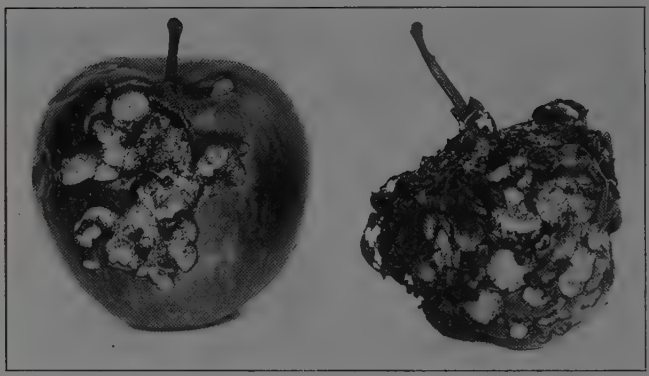
CORN BORER WORK.

a. View showing corn field with burner in operation.

b. Female, male, larva, pupa and burrow in cornstalk. Slightly enlarged.

EUROPEAN CORN BORER.

a. Japanese beetle, *Popillia japonica* Newm.; adults twice enlarged.

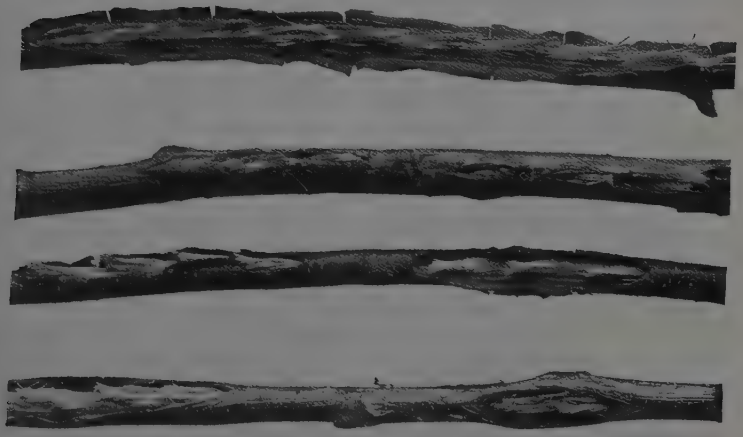


b. Apples injured by Japanese beetles (After Jap. Beetle Lab. U. S. Dept. of Agriculture).

c. Japanese beetles clustered on fruit (After Jap. Beetle Lab., U. S. Dept. of Agriculture).

JAPANESE BEETLE.

a. Males (below) and females (above). Natural size.



b. Twigs mutilated by the females in laying eggs.

THE PERIODICAL CICADA.

PLATE XXVI

a. b. c.

a, pupal shells on leaf; b, adult and pupal shells on tree trunk; c, adults and pupal shell on twigs; a and c natural size, b much reduced.

a. Apple twigs, splintered by periodical cicada; six years after injury, natural size.

b. Woodland in Westbrook stripped by cankerworms. Photo, June 22, 1928.

WORK OF PERIODICAL CICADA AND CANKERWORMS.

a. Nests of pipe organ wasp, natural size.

b. Male of pipe organ wasp, natural size.

c. Nests of pipe organ wasp, under side showing spiders in cells, natural size.

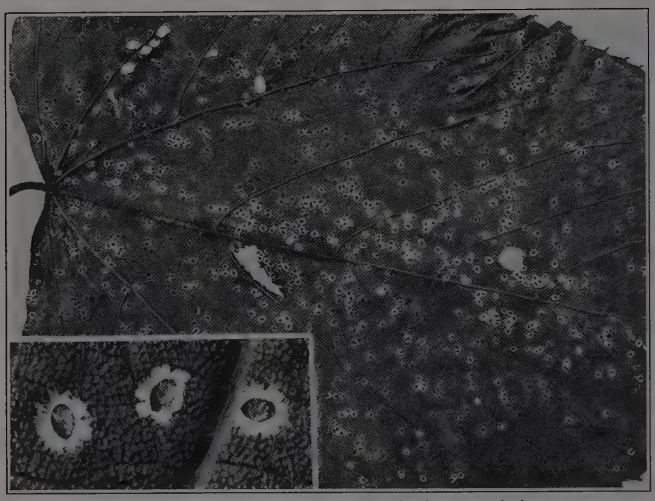
PIPE ORGAN WASP.

a. Spruce twig with leaves webbed together by spruce Epizeuxis, somewhat reduced.

b. Spruce Epizeuxis, adult moth twice natural size.

c. Say's blister beetle, natural size.

d. Peach foliage injured by Say's blister beetle, natural size.



a. Mulberry whitefly on linden leaf, natural size.
(insert enlarged ten times)

b. The same on leaves of mountain laurel, natural size.

MULBERRY WHITEFLY

a. Magnolia branch showing flies killed by fungus, reduced.

b. Magnolia leaf showing dead flies, natural size.

CARRION FLIES KILLED BY FUNGUS.

a. Ditching through cat-tails. Quinnipiac marsh, Hamden. Spade raised to cut sod.

b. Removing the sod.

MOSQUITO CONTROL WORK

a. Breeding pools at South End marsh, East Haven, before ditching.

b. Same view; pools eliminated by ditching.

a. Marsh at Short Beach, Branford, where drainage has been restricted for years by trolley embankment.

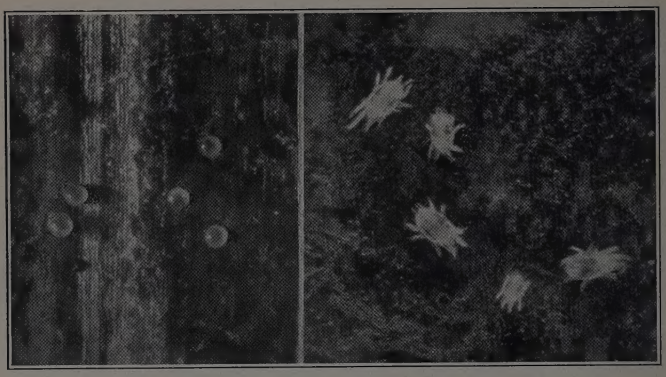
b. Same marsh after ditching and enlarging outlet.

MOSQUITO CONTROL WORK.

a. A small section of an extensive breeding area, Great Island, Old Lyme.

b. The same area about one week after ditching.

MOSQUITO CONTROL WORK.



a. Eggs at left, mites at right, all greatly enlarged.

b. Phlox leaves injured by red spider, natural size.

GARDEN RED SPIDER